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Plant Indicator Guide for Northern British Columbia: the Northern Portion of the MS and ICH Biogeoclimatic Zones

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Ministry of Forests Forest Science Program

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Plant Indicator Guide for Northern British Columbia: the Northern Portion of the MS and ICH Biogeoclimatic Zones

Leisbet Beaudry, Ray Coupé,
Craig DeLong, and Jim Pojar

BRITISH COLUMBIA Ministry of Forests Forest Science Program

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INTRODUCTION

This guidebook shows how the distribution of common forest plants changes due to variations in climate, terrain, site, and soil conditions across the northern British Columbia wetbelt and subalpine zones. The guide contains more than 120 plant species or species groups that occur in the northern Montane Spruce (MS) and the northern Interior Cedar–Hemlock (ICH) biogeoclimatic zones.

This guidebook is intended to assist foresters and other natural resource managers who work in the field to understand the distribution of species within a subzone and variant. Understanding the distribution of a species allows one to identify:

- species that are good indicator plants,
- soil, site, and climate factors,
- plants that grow together,
- biogeoclimatic classification (zone, subzone, and site series),
- where changes in ecosystems occur, and
- how a species will change after disturbance.

This guidebook can be used to assist in ecosystem mapping, vegetation resource inventories, silviculture prescriptions, restoration projects, research site identification, and review and auditing of field work. The guide also consolidates information on indicative values of plant species and includes images for quick identification.

It is not the intent of this guidebook to provide information on identification of plant species. Many excellent guides are available (Roberts 1983; Vitt et al. 1988; MacKinnon et al. 1992; Parish et al. 1996). Nor is the intent of this guide to identify ecosystems and ecosystem associations, which are presented in the regional field guides for site identification and interpretation (Banner et al. 1993; DeLong and Jull 1996; DeLong et al. 1996; Steen and Coupé 1997).

FIGURE 1 *The area of British Columbia covered by the guidebook.*

ABOUT THE GUIDEBOOK

The guidebook has compiled plant species information from two B.C. Ministry of Forests datasets: the ecosystem classification dataset (1246 plots) and the mature and climax seral information from the terrestrial ecosystem mapping dataset (266 plots). These datasets were collected primarily from mature and old forests and contain for the most part forest-dwelling plants. Only species with sufficient data to be able to identify their ecological distribution are included in this guidebook. Information on species in pioneer and young seral forests is derived from an extensive literature review and personal experience of the authors. The seral stage information is presented in the indicator value section. There are very few data collected in wetlands and grasslands, so this guidebook contains only a few plant species representative of these ecosystems.

Species identification in the field for some species is very difficult. When the accuracy of field identification was doubtful, the species have been grouped at the genus level for presentation. The plant species nomenclature follows Ministry of Forests currently accepted common and scientific names (Meidinger et al. 2002). Scientific names that have recently changed are noted in the Indicator Values and Species Notes section.

The data for the northern ICH and northern MS biogeoclimatic zones have been grouped by moisture (relative precipitation), which is denoted by the subzone name. Subzone groupings were checked for appropriateness by comparing the distribution of selected species across the subzones. Groupings are shown in Table 1.

Within each subzone grouping, the data for each species were summarized by occurrence, percent cover, and prominence to develop a composite edatopic grid. Prominence is a factor that reflects the combination of cover and occurrence. The regional field guides were used to confirm the database analysis, then the regional ecologists reviewed the composite grids, and their comments were incorporated into the final grid locations. The final edatopic grid location indicates the moisture and nutrient conditions where a species commonly grows in mature and old (climax and near-climax) forests.

The information was analyzed and compiled by Leisbet Beaudry (P. Beaudry and Associates Ltd.) and reviewed by forest ecologists Ray Coupé (Cariboo Forest Region), Craig DeLong (Prince George Forest Region), and Jim Pojar (Prince Rupert Forest Region). Any errors and omissions should be attributed to P. Beaudry and Associates Ltd. as they are responsible for the final editing.

TABLE 1 *Subzone groupings of the northern ICH and northern MS*

Precipitation regime	Northern ICH	Precipitation regime	Northern MS
dry (d)	dk	very dry (x)	xv
moist (m)	mm, mc1, mc2, mk3	dry (d)	dc1, dc2, dv
wet (w) and very wet (v)	wk2, wk3, wc, vk2		

Plant species occur over a particular range of relative moisture and nutrient regimes within any one subzone. Each edatopic grid depicts the predominant moisture and nutrient regimes where a species will most likely occur in old or mature (climax or near-climax) forests. The species distribution relative to moisture and nutrients is shown by a series of shaded cells on the edatopic grid. A fully shaded cell, a partially filled cell, and an empty cell are used to represent species distribution. A fully shaded cell indicates that the species commonly occurs on the combination of soil moisture and nutrient conditions. A partially shaded cell indicates that the plant has a lower occurrence or percent cover for that combination of soil moisture and soil nutrient regime. An empty cell does not mean that the species does not occur there; however, it may rarely occur there or occur there with a very low percent cover.

Some species do not occur in all subzones. When a species occurs sporadically in a zone and an edatopic grid range cannot be determined, then an empty edatopic grid is presented. Blank edatopic grids (without gridlines) are provided where a species has no recorded occurrence. When a subzone grouping is not shown on an edatopic grid, either the species occurs infrequently or the data are insufficient to determine the edatopic grid location. If a subzone grouping is shown but the species is restricted to a particular subzone, then the indicator value section will list in which subzones the plant species is not observed.

The range in moisture regime represented on the edatopic grid describes the variability in relative soil moisture found within each biogeoclimatic subzone. As a result, codes for moisture regime are comparable only within a subzone grouping. For example, all moist ICH subzones have similar relative moisture regimes but are different from the relative moisture regimes of the ICH wet (w and v) subzones (i.e., absolute moisture regime is different for each subzone grouping).

The best indicator species are plant species that are limited to a specific range on the edatopic grid. Both presence and absence of indicator plants can be used to determine moisture regime, nutrient regime, and site series.

To identify a site series, a transition between site series, or moisture and nutrient regimes, start by identifying the plant species in the ecosystem. For each plant species, determine if its range is restricted to a portion of the edatopic grid. Compare the range of each species and determine the range of overlap. This area of overlap identifies the range of soil moisture and nutrient regime of the ecosystem. It is possible, however, to find a species outside

FIGURE 2 *Edatopic grids showing full (a), partially full (b,c), and empty cells (d).*

the moisture and nutrient regime indicated on any grid, so it is important to rely on several plants and on the physical site characteristics (e.g., landform, aspect, soils, slope position) to determine moisture and nutrient regimes and site series of an ecosystem.

In seral stands, indicator species of mature and old forests can be less reliable for determining moisture and nutrient regimes. However, knowing how a species changes with disturbance and increased light availability enables one to predict which plants have indicative value in seral stands. This information when known is presented in the Indicator Values and Species Notes section.

Presence of particular plant species may also indicate other site factors; for example, frost-prone areas, sites with aerated soil moisture, or organic soil orders. This information is useful for writing prescriptions or auditing sites. Where known, this information is presented in the Indicator Values and Species Notes section.

INDICATOR VALUES AND SPECIES NOTES

Indicator value information has been compiled from the datasets, an extensive literature review, and the authors' personal knowledge of each plant species. The indicator value information is presented in the following order: exceptions in observed presence or absence in individual subzones; synonym of scientific and common names; indicator values of landform, climate, and site; shade tolerance; changes in abundance in seral communities; and value of the species for wildlife.

The two databases were summarized by plant species for landform, site, and soil characteristics. If a plant species was found to be limited to certain landform, site, or soil characteristics, then this information is provided in the Indicator Values and Species Notes section. (For example a plant species may have been found only on organic soil orders.) The landform, site, and soil characteristics summarized from the databases apply in particular to the northern ICH and northern MS biogeoclimatic zones. Extension of the database information to other biogeoclimatic zones should consider changes in regional characteristics. Some of the landform, site, and soil characteristics have been identified from the literature review. To identify the source of the information, a reference number in parentheses after the statement matches a numbered source document in the References.

Some species are tolerant of excess moisture. Excess moisture can be present due to the movement of excess water downward (seepage), or removed so slowly from the site that the watertable remains near the surface; or due to immersion of the substrate by water (flooding). The type and length of time excess water is on site is noted for tolerant species.

If plant species are known to be limited to a wetland class, this information is provided. Wetlands are divided into five ecosystem classes (Banner and Mackenzie 2000). Bogs are acidic wetlands composed of peats (decomposing layers of sphagnum moss, sedges, and grasses). Bogs receive moisture from rainfall and are isolated from groundwater sources. Fens are composed of peats but are less acidic than bogs and more mineral-rich. Fens receive nutrient and water inputs from groundwater. Swamps are treed or tall shrub mineral wetlands with significant water flow and periodic aeration of the

surface. Marshes are semi-permanently to seasonally flooded mineral wetlands dominated by emergent grass-like vegetation (Banner and Mackenzie 2000).

Tolerance of summer drought is the capacity of a species to survive growing-season moisture deficit. The length of time of moisture deficit is important, some species can survive short soil moisture deficits; others are capable of surviving long periods. When known, summer drought tolerance is noted.

Frost tolerance, when known, is noted in the guidebook. Frost tolerance is used to describe growing-season frost tolerance, the capacity of a species to survive temperatures below 0°C. Frost occurs in areas of cold air accumulation in depressions and valley bottoms during conditions of high nighttime surface cooling and/or cold air drainage (Luttmerding et al. 1990).

Some species have a preference for nitrogen-rich or nutrient-rich soils (slightly acidic and base-high parent material mineralogy). These species occur on the right-hand side of the edatopic grid in the soil nutrient classes of D (rich) and E (very rich). Some species are capable of surviving on sites with low-nutrient soils, with acidic substrates and base-low parent material mineralogy. These species will occur on soil nutrient classes of A (very poor) and B (poor).

Shade tolerance or the capacity of a species to survive in light of low intensity is provided by stating under what light conditions a species grows. The terminology used in this guidebook is that a species "grows well" or "persists" (not optimal growth) in "full sunlight," "partial shade," or "deep shade." When a species belongs to a particular shade tolerance class (shade tolerant, shade intolerant, or shade neutral) this is indicated. Shade neutral refers to species that establish and grow well in both full sunlight and in varying degrees of shade. The shade tolerance of a species varies across its geographic range as a relative ranking with other species in that geographic area. Other indicator values should also be considered in the context of a species geographical distribution; for example, it is well known that tolerance to early or late cold temperatures is related to genetic adaptations within a species.

Knowing under what light conditions a species grows well can be used to predict how the species occurrence and abundance will change with succession. For example, when a small opening is created by disturbance (e.g., windthrow), species that grow well in partial or deep shade will persist. If the disturbance creates a large opening, however, species that grow well in full sunlight dominate a site and species that grow well only in deep shade will decrease or disappear until canopy closure (shrub or tree canopy, depending on requirements of the species) occurs.

Terminology used for describing a forest's successional status corresponds to Luttmerding et al. (1990) and Province of British Columbia (1998a). The four successional classes used in the guide are pioneer seral, young seral, mature seral, and maturing climax. The structural stage of "old forest" has been included to provide the complete range of succession. How the abundance (cover and frequency) of a species is different from mature stands is noted by describing whether a species increases (frequency and/or cover increases), decreases, or persists (maintains cover and/or frequency) in abundance during a particular seral stage. Only known changes in abundance by seral stage are noted. If there is no information provided about a seral stage, then it is not known if the species is present and how its abundance changes.

Pioneer seral is "vegetation that occupies a site (initially) after site disturbance" (Luttmerding et al. 1990). Disturbance may be either natural (e.g., fire,

erosion) or anthropogenic (e.g., logging, site preparation). In both cases, very little of the original plant community structure remains. In addition, the humus layer and the seed bank may be reduced or destroyed. Information on seral species complexes is available in several B.C. Ministry of Forests field guides (Lavender et al. 1990; Banner et al. 1993; Steen and Coupé 1997)

When disturbance or particular types of disturbance are linked to changes in abundance or a change in edatopic grid location of a plant species, these are provided. General terminology is used to describe disturbance type. Scarification includes site preparation and other soil disturbances that result in mineral soil exposure and root damage. Fire includes wildfires and broadcast burning unless otherwise stated.

Young seral refers to "stands or communities that have not yet gone through a series of natural thinnings" (Luttmerding et al. 1990). The density of these stands is dependent on time since disturbance (not less than 60 years), type of disturbance, local climate, and species composition.

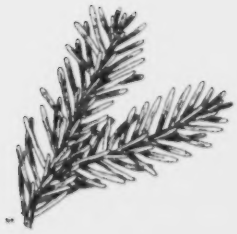
Mature seral stands can have diversity in species composition (both seral and climax species may be present), stand structure, and age classes. Such stands can thus be composed of both shade-tolerant and shade-intolerant species within their stand structure. Although they may not yet be dominated by climax species, mature seral stands may be as old as 140 years in the interior of British Columbia (Luttmerding et al. 1990), where many species frequently function as both seral and climax species.

Maturing climax describes a stand composed of species expected to form the climax stand on the site. The stand has experienced natural thinning, gaps have been created, and a structure similar to that expected at climax has developed. It differs from young seral in having better developed understorey (Luttmerding et al. 1990).

The structural stage of old forest describes old, structurally complex stands comprised mainly of shade-tolerant and long-lived trees species. Snags and coarse woody debris in all stages of decomposition and patchy understoreys are typical of old forest. Time since disturbance for the MS and ICHdk is generally >140 years and for the other ICH variants in the guide is >250 years. (Province of British Columbia 1998a). When "old forest" is used, the age of the stand is indicated where possible.

Wildlife use of the plant species has been included to provide an indication of wildlife habitat value.

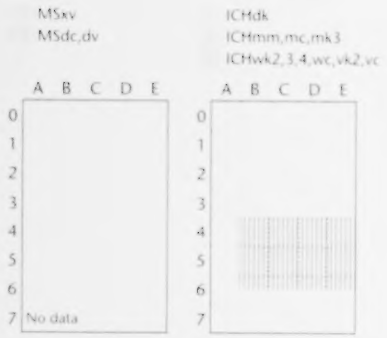
Trees



Abies amabilis – amabilis fir

Indicator Values and Species Notes

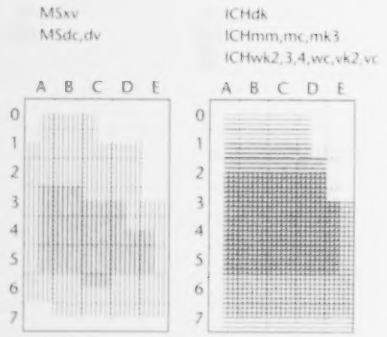
- not observed in MSxv, MSdc2, MSdv, ICHdk, ICHmk3, ICHwk2, or ICHwk4.
- tolerant of periodic flooding. (34)
- tolerant of periods of summer moisture deficit, provided there is adequate early growing-season moisture. (46)
- adapted to climates with high annual snowfall. (34)
- intolerant of frozen soils, grows in climates where snow cover occurs prior to significant freezing temperatures. (36)
- very shade tolerant, capable of establishing and growing in deep shade. (34, 35)
- good growth response to increased light (overstorey removal), but growth response delayed. (34)
- slow to naturally re-establish after fire. (69)
- survives up to 500 years. (69)
- moderately browsed by ungulates. (40, 61)



Abies lasiocarpa – subalpine fir

Indicator Values and Species Notes

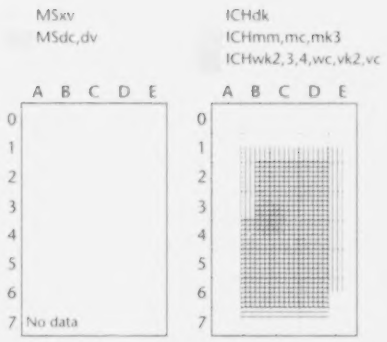
- tolerates fluctuating groundwater levels and survives periodic flooding. (34)
- adapted to heavy snow cover and tolerant of frozen soils. (34, 36)
- grows in areas of cold air drainage, survives growing-season frosts. (35, 67)
- intolerant of prolonged periods with summer drought or high temperatures. (46)
- shade tolerant; grows well in full sunlight, survives in deep shade but with reduced growth rate. (34, 35)
- advance regeneration may persist in pioneer seral stage following canopy removal.
- good growth response to overstorey removal.
- a fire-sensitive species, commonly suffers high mortality even from low-intensity fires.
- after fire, establishes on mineral soil and duff seedbeds. (69)
- persists in abundance in all seral stages. (18)
- survives for 400 years.
- regeneration moderately to heavily browsed by moose; cambium eaten by bears. (8, 40, 61)



Betula papyrifera – paper birch

Indicator Values and Species Notes

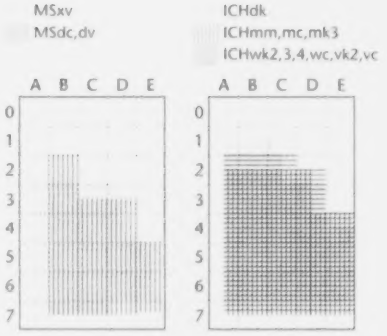
- not observed in MSxv or MSdv; uncommon in MSdc.
- intolerant of long periods of drought. (46)
- tolerant of early spring frosts and frozen ground. (34, 36, 49)
- survives short periods of flooding and may occur on poorly drained soils. (34)
- intolerant of extremely heavy snow loads (breakage). (25)
- shade intolerant; grows well in full sunlight, tolerates more shade on richer sites. (34, 49)
- after fire and mechanical disturbance, resprouts from stumps and seeding-in on mineral seedbeds. (2, 25, 46)
- forms dense stands and may increase edatopic range in pioneer seral stage.
- often forms young and mature seral forests (100–140 years).
- important winter browse for ungulate species, young stems browsed by rodents and seed eaten by birds. (25, 40, 46, 61, 73)



Picea glauca – white spruce; *Picea engelmannii* – Engelmann spruce, and their hybrids

Indicator Values and Species Notes

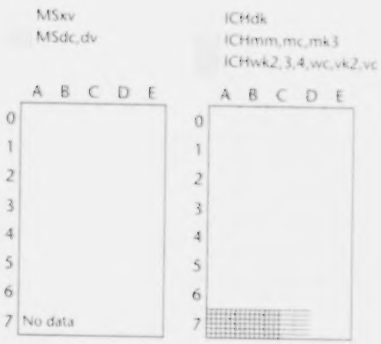
- *P. glauca* tolerant of short periods of flooding and saturated soils. (14, 34)
- *P. engelmannii* well adapted to heavy snow cover. (34)
- grows in cold air drainage sites; however, only moderately tolerant of growing-season frosts. (34, 67)
- *P. glauca* tolerant of cold soils, growing roots at soil temperatures of 5° C and warmer. (37)
- grows in full sunlight and partial shade, persists in full shade. (14, 34, 35)
- re-establishes after fire by seeding-in on thin forest floors and mineral soil. (69)
- recruits episodically and persists in all seral stages. (18)
- survives for 250–300 years. (14)
- cambium eaten by bears; buds eaten by deer, hares, and small rodents. (8, 22, 71, 73)



Picea mariana – black spruce

Indicator Values and Species Notes

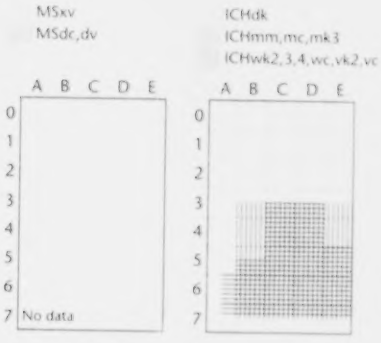
- not observed in MS, ICHwc, and ICHvc; uncommon in ICHmk3, ICHwk2, and ICHwk4.
- often associated with a restricted rooting depth on upland sites, and high watertables in wetlands.
- poor survival with prolonged flooding. (33)
- tolerant of growing-season frosts and grows in cold air ponding areas. (34)
- in the Cariboo Forest Region, when it occurs on lower slopes it indicates frost-prone sites. (67)
- grows well in full sun and partial shade, persists in deep shade. (34)
- re-established by seed after fire, fire helps seed release. (36)
- survives for 200–250 years. (69)
- needles eaten by hares. (73)

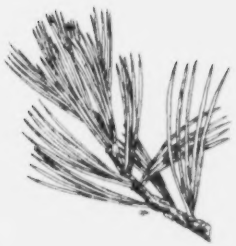


Picea x *lutzii* – Roche spruce

Indicator Values and Species Notes

- not observed in ICHmm, ICHmk3, ICHwk, and ICHvk2.

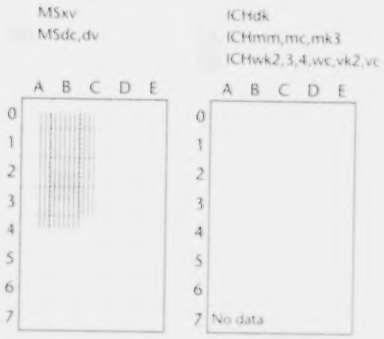




Pinus albicaulis – whitebark pine

Indicator Values and Species Notes

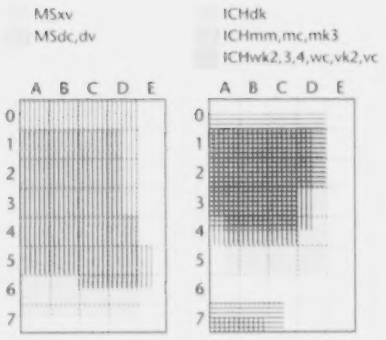
- typically a subalpine species, but occurs at middle elevations with restricted distribution.(35)
- tolerates summer drought. (69)
- tolerant of growing-season frosts and frozen ground. (34, 36)
- adapted to heavy snowfalls and strong winds. (41)
- grows well in full sunlight and in partial shade. (35, 41)
- moderately fire resistant, the open stands have low fuel characteristics. (41)
- survives for 500 years or more. (69)
- establishes after fire by bird-cached or bird-transported seed. (69)
- severely affected by white pine blister rust (*Cronartium ribicola*).
- seed eaten by Clark's nutcracker, squirrels, and bears.

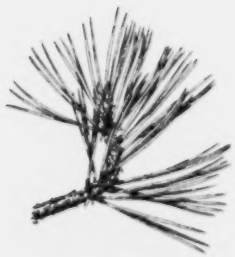


Pinus contorta – lodgepole pine

Indicator Values and Species Notes

- rare in ICHvc.
- tolerates periods of summer drought. (69)
- tolerant of growing-season frosts, commonly occurs on frost-prone sites. (34, 65, 67)
- very shade intolerant; grows in full sunlight, will persist in partial shade on drier sites. (34)
- after fire, rapidly re-establishes by seed from serotinous cones. (36)
- serotiny varies by elevation, stand age, and fire history. (69)
- capable of growing on a wider range of sites on the edatopic grid when planted.
- survives for 200 years. (69)
- browsed by ungulates; cambium eaten by bears, porcupines, and squirrels. (22, 61, 71)

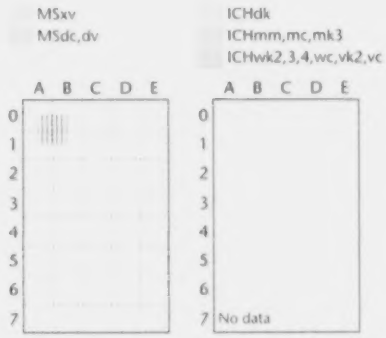




Pinus ponderosa – ponderosa pine

Indicator Values and Species Notes

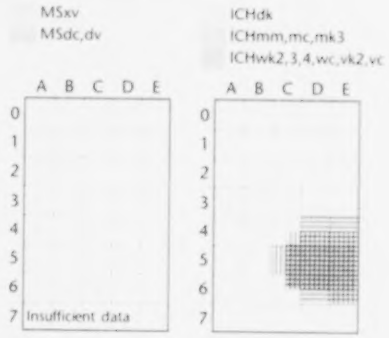
- not observed in MSdv and MSdc2.
- tolerates short periods of flooding. (36)
- tolerates high air temperatures and prolonged growing-season soil drought. (46, 69)
- grows in climates with an average frost-free period of 120 days. (69)
- grows in full sunlight and persists in partial shade. (34, 35)
- fire-resistant species due to its thick bark and self-pruning; re-establishes after fire by on-site and off-site seed. (46, 69)
- survives for 300–600 years. (69)
- seeds eaten by small mammals and birds; foliage provides moderate browse for deer and elk. (46, 61, 69, 71)



Populus balsamifera ssp. *trichocarpa* – black cottonwood

Indicator Values and Species Notes

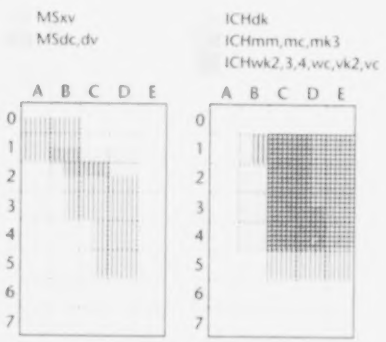
- uncommon in MSxv and MSdv.
- often found along riverbanks or in seepage areas. (25, 355)
- prefers sites with aerated soil water. (25)
- tolerates prolonged flooding, and high water-tables. (25, 36, 48)
- low drought tolerance. (25, 48)
- variable tolerance to dormant-season freezing temperatures due to high genetic variation. (69)
- associated with increased nitrogen availability. (48)
- very shade intolerant; grows best in full sunlight. (25, 34, 48)
- above-ground stems are highly susceptible to fire-kill. (25)
- after site disturbance, resprouts from stump, root fragments, and buried branches, and re-establishes by wind- and water-transported seed. (25, 48)
- increases in abundance and edatopic grid location in pioneer and young seral stands; may form deciduous, mature seral forests.
- survives for 150–200 years. (48)
- browsed by ungulates, hares, rodents, and small mammals; grouse feed on catkins and buds, bears feed on cambium. (14, 25, 40, 61)
- larger trees are nest/denning sites for marten, bears, herons, and cavity-nesting birds. (20)



Populus tremuloides – trembling aspen

Indicator Values and Species Notes

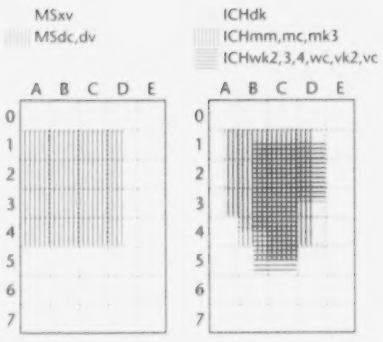
- not observed in ICHvc; occurs occasionally on steep, warm aspects in MSxv.
- considered a soil improver due to inputs of high levels of potassium and redistribution of nutrients to the surface soil layer through its litter. (25)
- tolerates periods (2–3 weeks) of flooding. (62)
- roots tolerant of frozen ground in winter, emerging leaves are susceptible to spring frosts. (36,47)
- shade intolerant; grows in full sunlight, persists in partial shade; does not regenerate well in shade. (2, 25, 34)
- establishes after fire and site disturbance by root suckering, root systems survive repeated burning. (62)
- increases in abundance and edatopic range in pioneer seral stands; can form deciduous or mixedwood, young and mature seral forests (100–150 years).
- browsed by ungulates, porcupine, beaver, hares, and grouse. (25, 40, 61, 73)
- larger trees are important habitat for owls, woodpeckers, and other cavity-nesting birds. (20)



Pseudotsuga menziesii – Douglas-fir

Indicator Values and Species Notes

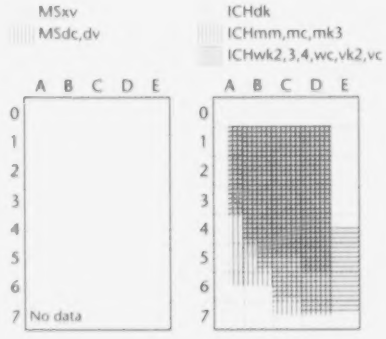
- not observed in MSdv, ICHmc, ICHwc, and ICHvc.
- intolerant of flooding. (36)
- drought tolerant in growing season. (46)
- frost intolerant; severely damaged on frost-prone sites. (67)
- shade intolerant; in areas of drier climate, seedling establishment is best under partial shade, in moist and wet climates it establishes best in partial shade to full sunlight. (34, 69, 72)
- increases in abundance after fire or site disturbance in moist and wet climates. (19)
- older trees with thicker bark are moderately resistant to surface fires. (69)
- survives for long periods (~500 years) in most climates.
- moderately browsed by ungulates, crown foliage is an important winter food source for mule deer; bears feed on cambium of younger trees. (8, 40, 61)

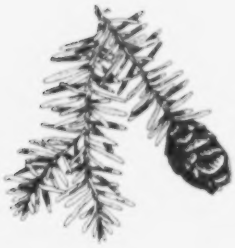


Thuja plicata – western redcedar

Indicator Values and Species Notes

- not observed in ICHwc or ICHvc.
- produces nutrient-rich litter.
- tolerates prolonged flooding. (36)
- intolerant of growing-season frosts and growing-season drought. (46, 67)
- shade tolerant; grows in partial shade, will persist in deep shade. (34, 35)
- persists after fire, difficult to kill; re-establishes after fire from off-site seeding-in on bare mineral soil. (69)
- occurs in all seral stages; survives for over 500 years in most climates. (69)
- browsed by ungulates. (40, 61)

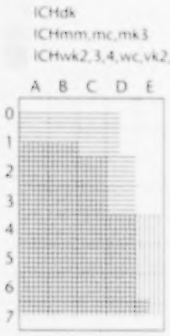


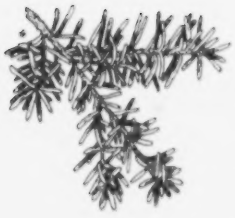


Tsuga heterophylla – western hemlock

Indicator Values and Species Notes

- uncommon in moisture levels 6 and 7 in ICHwc and ICHvc.
- uncommon in ICHmk3.
- tolerant of flooding of short duration. (36)
- does not grow well on sites with high water-tables. (69)
- intolerant of frozen soils, grows in climates where snow cover occurs prior to significant freezing temperatures. (36)
- very frost intolerant, severely damaged on frost-prone sites. (67)
- intolerant of growing-season drought. (46)
- shade tolerant; thrives in full sun and partial shade, persists in deep shade. (34)
- an agressive pioneer species due to quick growth in full light and ability to establish on all types of seedbeds. (69)
- occurs in all seral stages; capable of surviving up to 500 years in most climates. (69)
- browsed by deer and elk. (40, 61, 71)





Tsuga mertensiana – mountain hemlock

Indicator Values and Species Notes

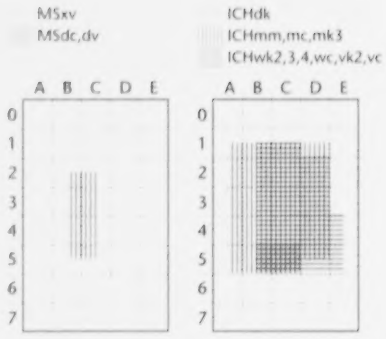
- not observed in ICHwk and ICHvk2.
- seedlings are drought intolerant. (69)
- adapted to heavy snow cover. (34)
- intolerant of frozen soils, grows in climates where snow cover occurs prior to significant freezing temperatures. (36)
- grows on acidic and organic soils in the northern portion of its range. (34, 69)
- shade tolerant; grows best in full sun and partial shade, will persist in deep shade. (34)
- survives to 400–700 years. (69)

Shrubs

Acer glabrum – Douglas maple

Indicator Values and Species Notes

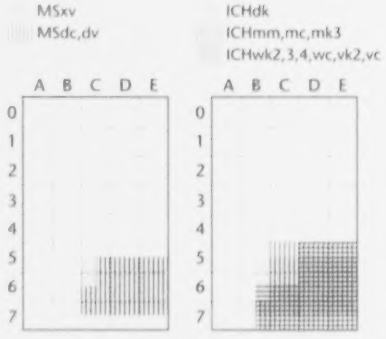
- not observed in MSdv.
- commonly associated with south-facing slopes. (25)
- tolerant of periodic flooding and moderately high watertables. (69)
- roots can survive frost prior to snowcover. (36)
- grows well in partial shade and full sunlight. (25, 64)
- after site disturbance and fire, resprouts readily from root crowns and seeds in from off-site. (9, 25, 69)
- persists or may increase in abundance in pioneer seral stage, decreases in abundance in young seral forests, persists in mature and maturing climax seral stages. (29, 69, 74)
- browsed by ungulates; provides nesting sites for birds. (25, 40, 61)



Alnus incana ssp. *tenuifolia* – mountain alder

Indicator Values and Species Notes

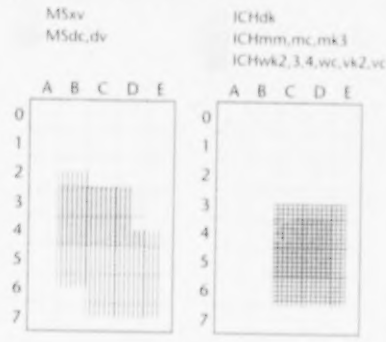
- synonym *A. tenuifolia*.
- tolerant of periodic flooding. (36)
- frost tolerant, grows on frost-prone sites. (36)
- associated with calcium-rich soils. (36)
- roots support nitrogen-fixing bacteria. (36)
- shade tolerant; grows well in partial shade, persists in full sunlight. (25, 36)
- persists or may increase in abundance in pioneer and young seral forests.
- after fire, sprouts from root crown or re-establishes from wind-transported seed. (9)
- present in old forests (>160 years). (68)
- edatopic range may increase in pioneer seral stage.
- low importance for ungulates; browsed by hares, and catkins eaten by squirrels. (25)



Alnus viridis ssp. *sinuata* – Sitka alder; ssp. *crispa* – green alder

Indicator Values and Species Notes

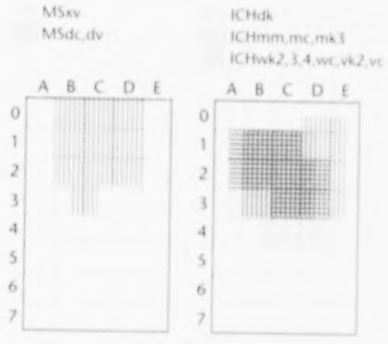
- synonym *A. crispa*.
- frost-tolerant, will grow on shallowly thawed permafrost soils. (36, 69)
- tolerates flooding. (36)
- adapted to heavy snow loads. (25)
- roots support nitrogen-fixing bacteria. (36)
- shade intolerant; grows well in full sun, persists in partial shade. (2, 64)
- often indicates prior mineral soil exposure on the site. (46)
- rapid increases in abundance after fire, re-establishes by wind-transported seed, sprouts from root crowns and produces seed at an early age. (2, 16, 25, 32, 44)
- after mechanical disturbance, sprouts from root crowns. (69)
- persists or increases in abundance in pioneer and young seral stage, persists in maturing seral stage (up to 180 years). (25, 64)
- low browse value for ungulates; browsed by hares; squirrels eat catkins. (25, 61, 73)



Amelanchier alnifolia – saskatoon

Indicator Values and Species Notes

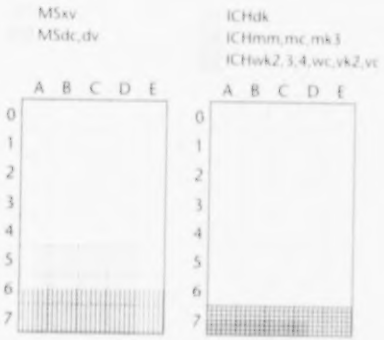
- rare in ICHvc.
- grows well in partial shade, persists in full sunlight, declines in deep shade. (35, 65, 69)
- after fire, resprouts from surviving root crown; in harvested areas sprouts from rhizomes and root crowns. (45, 69)
- persists and may increase in abundance in pioneer seral stage and in deciduous, mature seral forests. (35, 64, 65)
- browsed by ungulates and livestock; bears, small mammals, and birds eat the fruit. (8, 22, 40, 45, 46, 58, 61)



Betula nana – scrub birch

Indicator Values and Species Notes

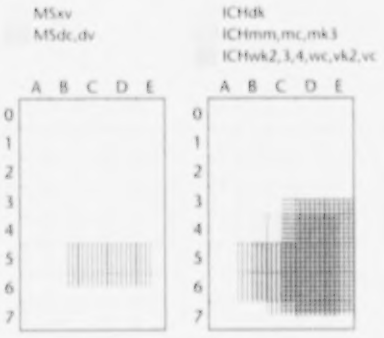
- synonym is *B. glandulosa*.
- tolerant of high watertables. (46)
- tolerant of growing-season frosts, an indicator of a frost-prone site. (67, 69)
- grows on permafrost. (69)
- grows well on moderately acidic soils.
- shade intolerant; grows well in full sunlight, persists in partial shade. (36, 69)
- rapid increases in abundance after fire from root sprouting. (32)
- browsed by ungulates and bears; seed eaten by birds. (22, 40, 61, 69)



Cornus stolonifera – red-osier dogwood

Indicator Values and Species Notes

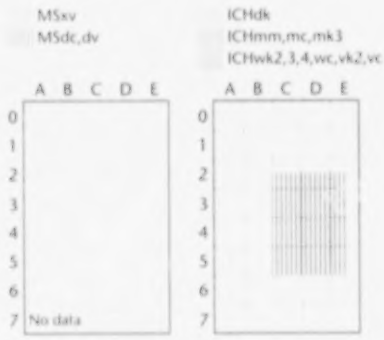
- uncommon in MSdv.
- characteristic of fluvial and other moist nutrient-rich ecosystems. (25, 34)
- tolerates growing-season frosts and extremely cold temperatures. (69)
- tolerant of fluctuating watertables and perodic flooding. (25, 69)
- shade tolerant; grows well in partial shade. (25, 35)
- after low-intensity fires, resprouts from root crowns and re-establishes from seed stored in the ground. (9, 25)
- generally increases in abundance in pioneer and young seral forests. (9, 25)
- present in old forests (>160 years). (68)
- persists and may also increase edatopic grid range in deciduous, mature seral forests.
- resprouts rapidly after browsing.
- important ungulate browse; berries are eaten by bears, rodents, birds, and fish. (8, 22, 25, 46, 61, 69)



Corylus cornuta – beaked hazelnut

Indicator Values and Species Notes

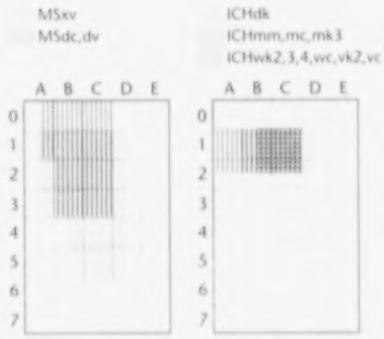
- not observed in ICHmm, ICHmk3, ICHwc, and ICHvc.
- occurs below 1600 m elevation.
- intolerant of high summer temperatures. (25)
- shade intolerant; grows well in full sunlight, persists in partial shade. (2)
- after fire, resprouts from root crowns and lateral root suckers. (2, 25)
- increases in abundance in the pioneer seral stage. (2, 17)
- characteristic of young seral broad-leaved forests. (35)
- browsed by ungulates; fruit eaten by bears, small mammals, and birds. (2, 25, 22, 40)



Juniperus communis – common juniper

Indicator Values and Species Notes

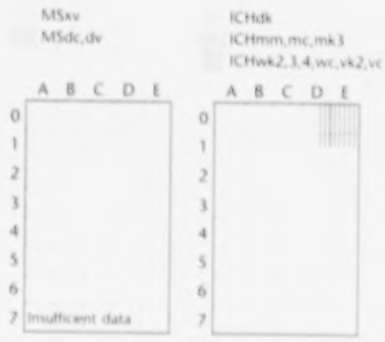
- not observed in ICHmm or ICHvc.
- commonly found on mor humus forms.
- shade intolerant; grows well in full sunlight, persists in partial shade. (46)
- susceptible to fire, re-establishes slowly with on-site and animal-transported seed. (9)
- persists in abundance in pioneer seral stage.
- moderately browsed by deer and elk. (40, 45, 61)



Juniperus scopulorum – Rocky Mountain juniper

Indicator Values and Species Notes

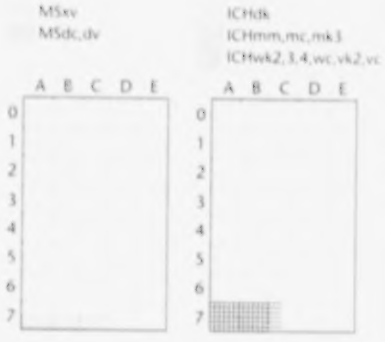
- not observed in ICHmm or ICHmk3, rare in ICHwk2.
- shade intolerant; grows well in full sunlight and persists in partial shade. (35, 46)
- *Juniperus* spp. are moderately browsed by deer and elk. (61)



Kalmia microphylla – western bog-laurel

Indicator Values and Species Notes

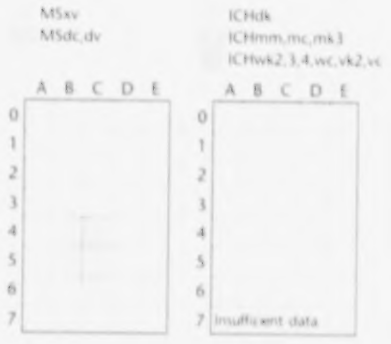
- wetland indicator species. (52)
- occurs in wetlands on organic soils with saturated mor humus forms.
- poisonous to humans and domestic livestock.



Ledum glandulosum – trapper's tea

Indicator Values and Species Notes

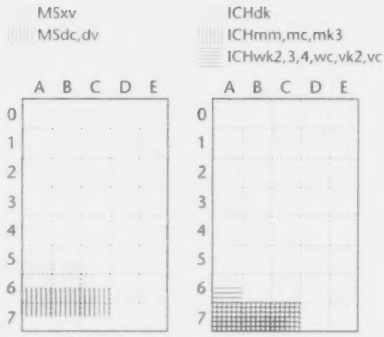
- predominantly restricted to SE part of MSxv.
- commonly found on soils with mor humus forms.
- shade neutral; grows well in all light regimes.
- poisonous. (46)



Ledum groenlandicum – Labrador tea

Indicator Values and Species Notes

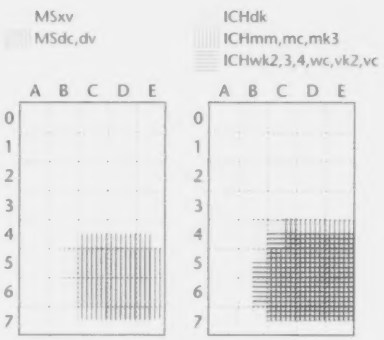
- characteristic of acidic, nutrient-poor wetlands and wet forests. (35)
- found on poor to very poorly drained soils with mor humus forms.
- shade intolerant; grows well in full sunlight. (35)
- after fire or forest canopy removal, increases in abundance. (32)
- abundance remains constant from early seral to maturing seral stage. (32)
- after disturbance, resprouts from root crowns and rhizomes. (69)
- low browse value for hares and caribou. (61,73)
- poisonous to humans. (46)



Lonicera involucrata – black twinberry

Indicator Values and Species Notes

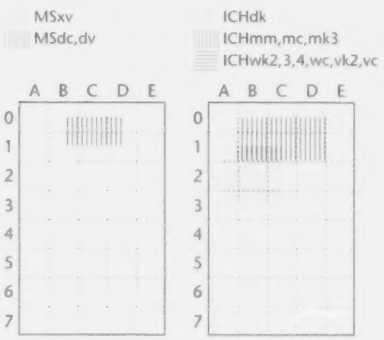
- tolerant of fluctuating groundwater levels. (25)
- grows in frost pockets and areas of cold air drainage. (25, 66)
- preference for nutrient-rich soils. (35)
- shade intolerant, grows well in full sunlight, persists in partial shade. (25)
- after low-intensity fires or site disturbance, resprouts from roots and re-establishes from on-site seed; severe-intensity fires can eliminate *L. involucrata*.(25)
- persists or may increase in abundance and edatopic range to 3B in pioneer and young seral forests.
- present in all seral stages. (18)
- winter browse for ungulates; berries eaten by bears, other mammals, and birds. (8, 22, 25, 40, 73)



Mahonia aquifolium – tall Oregon-grape

Indicator Values and Species Notes

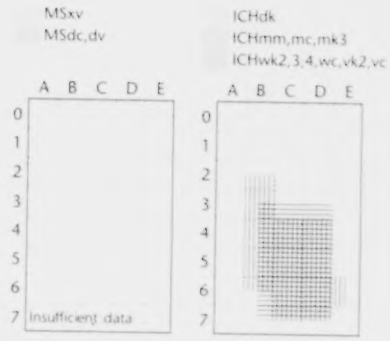
- not observed in MSdc1, MSdv, ICHmm, ICHmc, ICHwc, and ICHvc.
- grows well in partial shade and full sunlight.
- flowers in both clearcuts and leave strips. (42)
- persists in abundance in pioneer seral stage.
- browsed by ungulates; berries eaten by bears and birds. (22, 40)

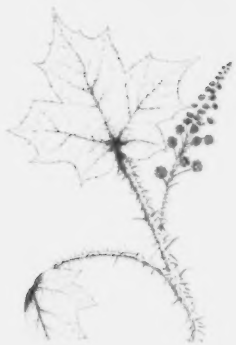


Menziesia ferruginea – false azalea

Indicator Values and Species Notes

- not observed in ICHmk3; uncommon in ICHwk2 and ICHwk4.
- adapted to heavy snowpacks and growing-season frost. (69)
- commonly found on soils with mor humus forms.
- restricted to decaying wood on nutrient-rich sites. (35)
- grows well in partial shade and full sunlight, persists in deep shade. (25)
- susceptible to fire-kill; after low-intensity fires, resprouts from root crown. (15, 25)
- after site disturbance, resprouts from root crowns, stem buds, and layering at higher elevations. (69)
- may increase in abundance in pioneer stage; decreases in abundance in young and mature seral stands. (4, 25, 69)
- in maturing climax and old-forest (>250 years) seral stages, *M. ferruginea* increases in abundance. (4)
- moderate browse for deer and elk. (25, 40)

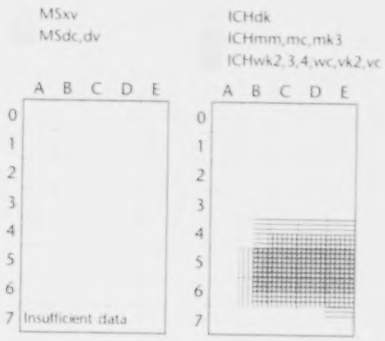




Oplopanax horridus – devil's club

Indicator Values and Species Notes

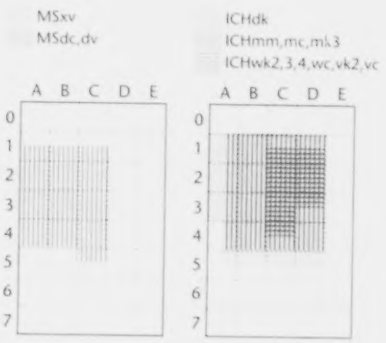
- associated with well-aerated, seepage water.
- intolerant of summer frost-prone sites. (67)
- preference for nitrogen-rich soil. (35)
- shade tolerant; grows well in full shade. (35)
- susceptible to fire-kill, after low-intensity fires, may sprout from root crown. (21)
- decreases in abundance and range on edatopic grid in pioneer seral stage. (4)
- increases in abundance in maturing climax seral stage and in old forests (>250 years). (4, 69)
- present in all seral stages. (18)
- browsed by bears and elk; berries eaten by bears. (8, 22, 40, 61)

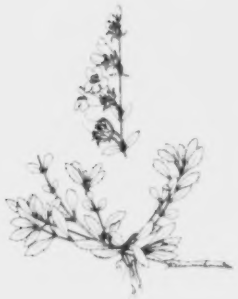


Paxistima myrsinites – falsebox

Indicator Values and Species Notes

- in ICHvk2 is associated with limestone.
- commonly found on soils with mor humus forms.
- inhabits decaying wood on nutrient-rich sites. (35)
- susceptible to *Armillaria* root disease. (46)
- grows well in partial shade, persists in full sun. (44)
- after low- to moderate-intensity fires, re-sprouts from taproot. (45)
- persists or may increase in abundance in pioneer seral stage. (35)
- persists in old forests. (65)
- high browse value for deer, mountain goat, moose, and cariboo. (40, 46, 61)

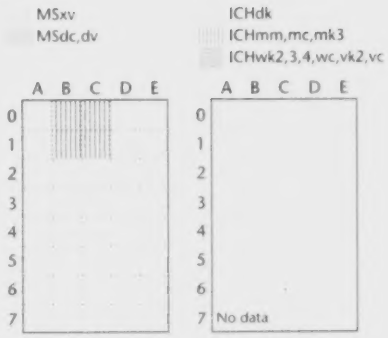




Penstemon fruticosus – shrubby penstemon

Indicator Values and Species Notes

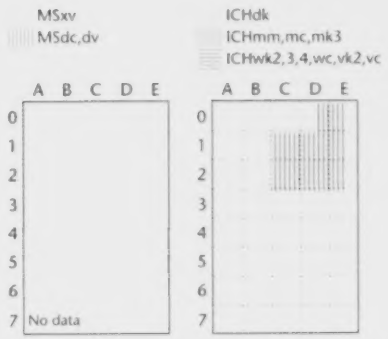
- shade intolerant. (46)
- persists in abundance in pioneer seral stage. (46)
- commonly establishes on exposed mineral soil on warm aspects.
- low browse value for ungulates. (40, 61)

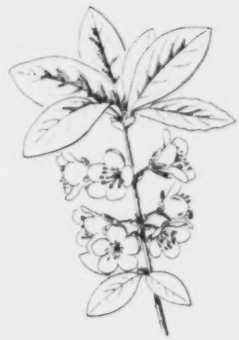


Prunus virginiana – choke cherry

Indicator Values and Species Notes

- not observed in ICHmm; observed in ICHmk3 on steep warm aspects in early to young seral stages.
- observed in ICHwc on very dry, rich sites.
- intolerant of poor drainage and prolonged flooding. (69)
- grows well in partial shade and full sun. (69)
- after fire, resprouts from root crown. (45)
- occurs in all seral stages. (69)
- grazing reduces vigour. (45)
- fruit eaten by bears, birds, and small mammals. (45, 69)

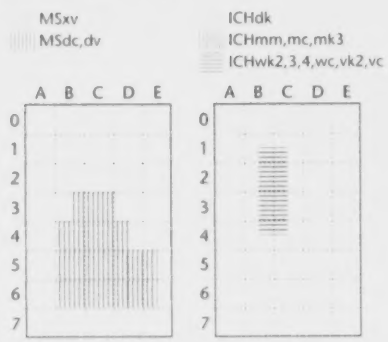




Rhododendron albiflorum – white-flowered rhododendron

Indicator Values and Species Notes

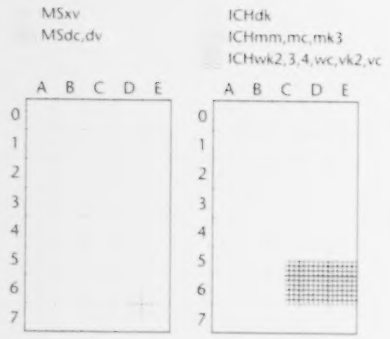
- not observed in MSdc1, MSdv, ICHmc, ICHwk3, ICHwc, and ICHvc; infrequent at higher elevations in ICHwk2 and ICHwk4.
- usually indicates subalpine communities or cold air drainage. (25)
- adapted to high snow loads. (25)
- litter extracts have allelopathic potential. (25)
- commonly observed in nitrogen-poor environments. (18)
- grows best in partial shade and full sunlight, persists in deep shade. (25)
- resprouts slowly after fire. (25)
- persists in abundance in pioneer seral stage.
- unpalatable to livestock and ungulates. (25)



Ribes hudsonianum – northern blackcurrant

Indicator Values and Species Notes

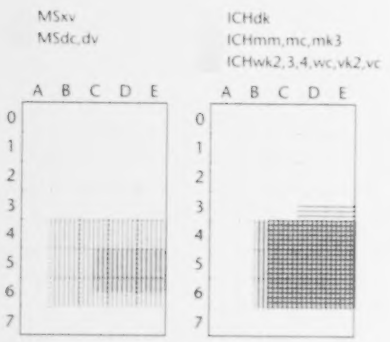
- not observed in ICHmm and ICHvk2; uncommon in ICHmk3 and ICHwk.
- persists in abundance in pioneer seral stage.
- low browse value for moose and deer; berries eaten by bears. (22, 61)



Ribes lacustre – black gooseberry

Indicator Values and Species Notes

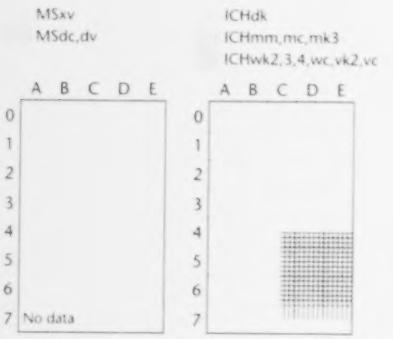
- moderately tolerant of growing-season soil moisture deficit. (25)
- preference for nitrogen-rich soil.(35)
- grows well in full sun and partial shade, persists in deep shade. (25, 64)
- after low-intensity fires, establishes from on-site seed; weak resprouter from root crowns. (25, 69)
- increases in abundance in pioneer seral stage; present in all seral stages. (18, 64)
- not usually browsed; fruit eaten by bears, small rodents, skunks, and birds. (8, 22, 25)



Ribes laxiflorum – trailing blackcurrant

Indicator Values and Species Notes

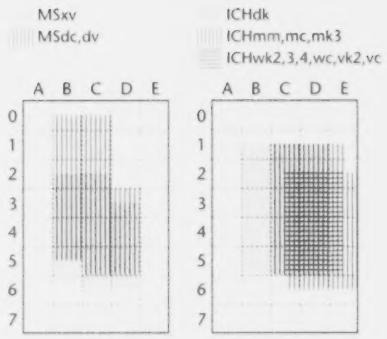
- shade tolerant, grows in partial shade.
- after site disturbance, increases in abundance in pioneer seral stage, decreases in abundance in young seral stage. (4)
- low browse value for moose and deer; berries eaten by bears. (22)



Rosa acicularis – prickly rose

Indicator Values and Species Notes

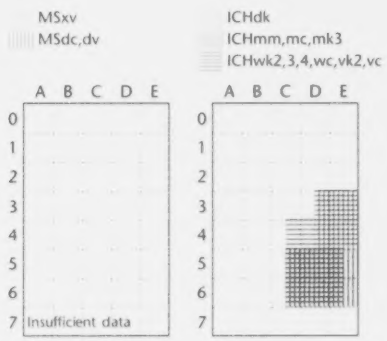
- tolerates periods of summer drought, as well as temporary flooding. (69)
- grows poorly on peaty soils and sites with restricted drainage. (69)
- grows well in partial shade and full sunlight. (25)
- persists or may increase in abundance in pioneer seral stage.
- after low-intensity fires or site disturbance, resprouts from rhizomes, or re-establishes by on-site or animal-transported seed. (2, 45, 69)
- present in old forests (>160 years). (68)
- fruit eaten by small mammals and birds. (2)
- browsed by ungulates, cattle, birds, porcupine, beaver, rodents, hares, and other mammals; rose hips are eaten by bears, coyotes, small mammals, and birds. (8, 22, 25, 40, 73)

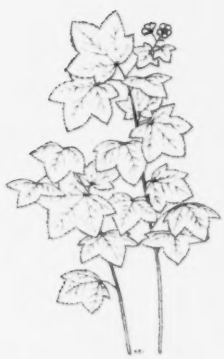


Rubus idaeus – red raspberry

Indicator Values and Species Notes

- characteristic of disturbed sites. (25)
- intolerant of high watertables.
- tolerates summer drought. (25)
- preference for nitrogen-rich soil. (35)
- shade intolerant, grows well in full sunlight and persists in partial shade. (25, 35)
- after low- to severe-intensity fires and site disturbance, resprouts from roots and re-establishes by on-site and animal-transported seed. (2, 69)
- increases in abundance in pioneer seral stage. (2, 35)
- browsed by bears, deer, and hares; fruit eaten by small mammals, birds, and bears. (2, 8, 22, 25, 71, 73)

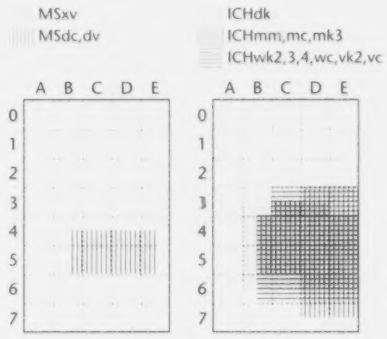




Rubus parviflorus – thimbleberry

Indicator Values and Species Notes

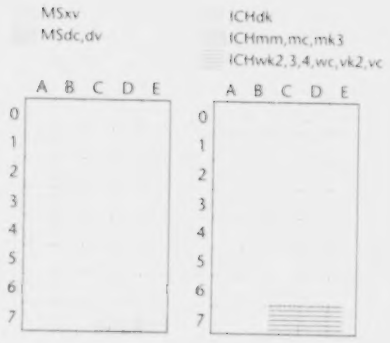
- not observed in MSdv.
- can survive on sites with snow creep. (69)
- preference for nitrogen-rich soil. (35)
- grows well in partial shade and full sunlight, will persist on wet sites in deep shade. (25, 64)
- after fire and site disturbance, resprouts from roots and root crown, and animal-transported seed. (25, 44, 45)
- after fire and site disturbance, increases in abundance in pioneer seral stage. (26, 19, 74)
- in pioneer seral stage, increases edatopic range on edatopic grid.
- persists in deciduous, young and mature seral forests. (18)
- browsed by deer, moose, elk, and bears; fruit eaten by many birds and mammals. (8, 22, 25, 61, 71)



Salix barclayi – Barclay's willow

Indicator Values and Species Notes

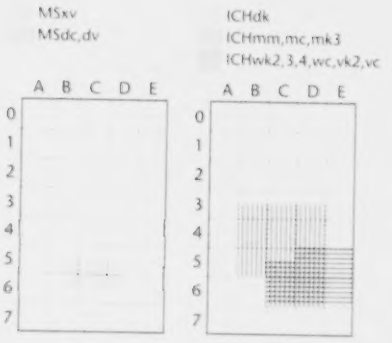
- not observed in ICHwk3 and ICHvk2.
- grows on wet, cold air accumulation sites.
- shade intolerant, grows well in full sunlight.
- persists or may increase in abundance in pioneer seral stage.
- browsed by ungulates, bears, and hares. (8, 22, 40, 73)



Salix bebbiana – Bebb's willow

Indicator Values and Species Notes

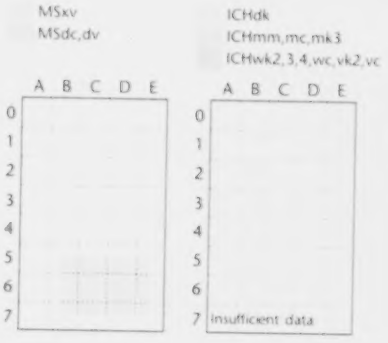
- tolerates short periods of flooding. (69)
- intolerant of summer drought. (69)
- shade intolerant, grows well in full sunlight and persists in partial shade. (35)
- after low- to moderate-intensity fires and site disturbance, sprouts from roots and basal stem, and re-establishes from wind-transported seed on exposed mineral soil. (69)
- in pioneer seral stage, increases in abundance and edatopic range to mesic and moist sites.
- browsed by ungulates and hares. (40, 73)



Salix glauca – grey-leaved willow

Indicator Values and Species Notes

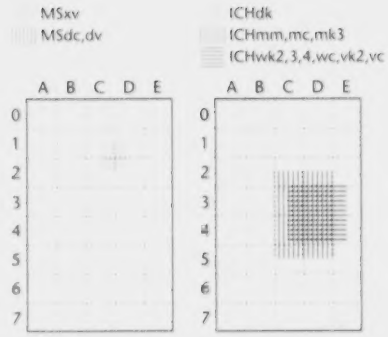
- frequently indicates frost-prone sites. (67)
- grows well in full sunlight and partial shade.
- increases in abundance in pioneer seral stage, persists in abundance in mature seral stage. (69)
- after fire and disturbance, resprouts from root crowns and re-establishes by transported seed. (69)
- browsed occasionally by moose.



Salix scouleriana – Scouler's willow

Indicator Values and Species Notes

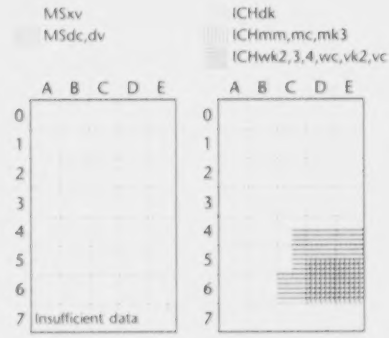
- rare in ICHvc.
- shade intolerant, grows well in full sunlight, persists in partial shade. (25, 35, 65)
- after fire, resprouts from root crowns and establishes from wind-transported seed. (44, 45)
- prefers mineral soil for regeneration. (63)
- increases in abundance in pioneer seral stage after fire and site disturbance and increases in edatopic grid range. (25, 44)
- persists in abundance in young seral forest, persists in small openings in maturing climax seral stage. (34, 64)
- will resprout following overstorey thinning. (69)
- browsed by ungulates, small mammals, rodents, birds, and livestock. (25, 45, 50)



Sambucus racemosa – red elderberry

Indicator Values and Species Notes

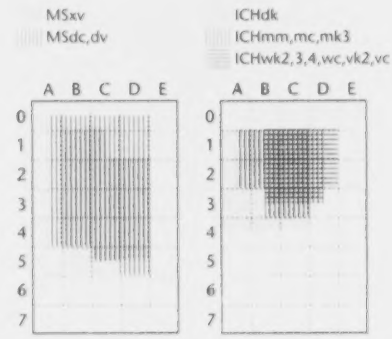
- commonly found on moder humus forms.
- indicative of rapid decomposition of forest floor materials, following canopy removal. (35)
- preference for nitrogen-rich soils, indicates high nitrate availability in mature seral stands. (25, 35)
- shade neutral, most vigorous in full sunlight and partial shade but will grow in all light regimes. (25)
- after low-intensity fires, resprouts from rhizomes and rootcrowns, re-establishes from buried seed. (9, 25)
- persists and may increase in abundance in pioneer seral stage; present in all seral stages; persists in abundance in mature seral deciduous forests. (18, 69)
- will sprout following overstorey thinning. (69)
- buds and bark browsed by ungulates and small mammals; fruit eaten by small mammals, bears, and birds. (8, 22, 25, 40, 61)

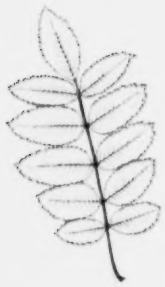


Shepherdia canadensis – soopolallie

Indicator Values and Species Notes

- not observed in ICHvk2.
- frost tolerant. (58)
- tolerant of summer drought. (58)
- roots support nitrogen-fixing bacteria. (35, 45)
- grows well in full sunlight and partial shade. (46)
- moderately resistant to burning, resprouts from the root crown and tap root. (45)
- persists or may increase in abundance in pioneer seral stage.
- browsed by deer; berries eaten by bears, small mammals, and birds. (8, 22, 61, 69)

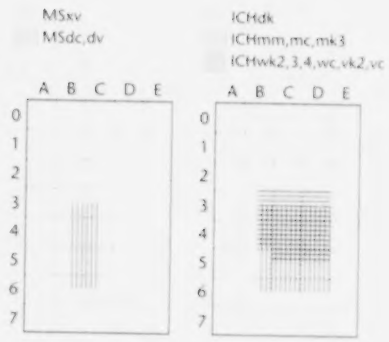




Sorbus spp. – mountain-ash

Indicator Values and Species Notes

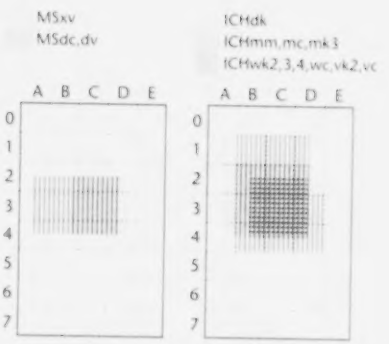
- *S. sitchensis* is not observed in MSdv.
- *S. scopulina* is uncommon in the MS zone and *S. sitchensis* is uncommon in the ICH zone.
- grows well in partial shade and full sunlight. (69)
- persists in abundance in pioneer seral stage.
- after fire, *S. scopulina* resprouts from rhizomes. (9)
- browsed by moose and caribou; fruit eaten by bears, birds, and rodents. (8, 22, 40, 58)



Spiraea betulifolia – birch-leaved spirea

Indicator Values and Species Notes

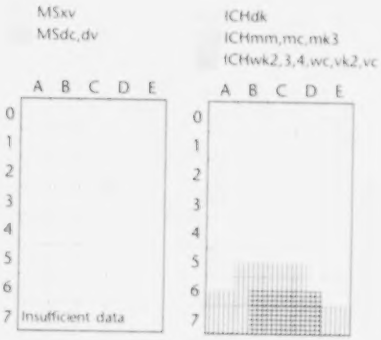
- not observed in ICHwc and ICHvc.
- grows well in full sunlight and partial shade. (46, 64)
- after fire, vigorously resprouts from rhizomes; slower recovery on drier sites. (1, 45)
- increases in abundance in pioneer seral stage; persists in abundance in deciduous, young and mature seral forests. (63, 69)
- moderate browse value for deer. (36, 41, 71)



Spiraea douglasii ssp. *menziesii* – pink spirea

Indicator Values and Species Notes

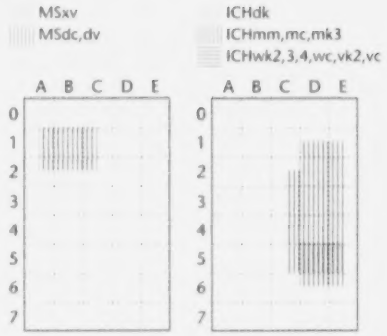
- not observed in ICHmm.
- common on wetlands and seepage sites. (35)
- tolerant of high and fluctuating watertables. (69)
- often indicates a growing-season frost-prone site. (67)
- grows well in full sunlight and partial shade. (24, 35)
- after fire, sprouts from rhizomes and stem base. (69)



Symphoricarpos albus – common snowberry

Indicator Values and Species Notes

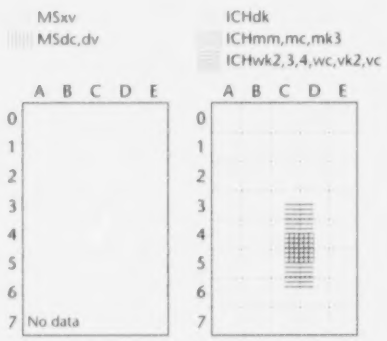
- tolerates fluctuating groundwater tables. (35)
- grows well in full sunlight and partial shade. (25, 63)
- after low- to moderate-intensity fires, resprouts from rhizomes and root crowns. (25, 45)
- persists and may locally increase in abundance in pioneer seral stage. (74)
- occasionally browsed by ungulates and livestock; resprouts well after browsing. (25, 40, 45, 61)
- fruit eaten by birds. (58)



Taxus brevifolia – western yew

Indicator Values and Species Notes

- not observed in ICHmc, ICHwk3, ICHwk4, ICHwc, ICHvk2, and ICHvc; uncommon in ICHmk3.
- tolerant of temporary flooding. (36)
- intolerant of frozen soils, grows where snow cover prevents ground from freezing. (36)
- shade tolerant, grows well in deep shade and partial shade. (35, 36, 46)
- easily killed by fire due to thin bark; slowly re-establishes from mainly bird-transported seed. (21, 69)
- seedling establishment is more favourable beneath a canopy. (21, 69)
- decreases in abundance in pioneer and young seral stages. (19, 57, 69)
- a maturing climax and old-forest species (>450 years). (57, 69)

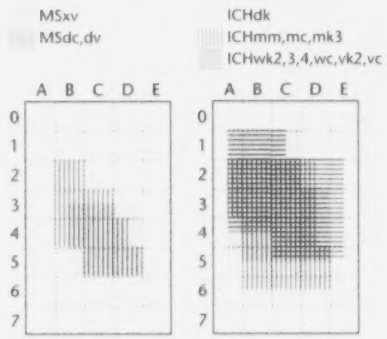


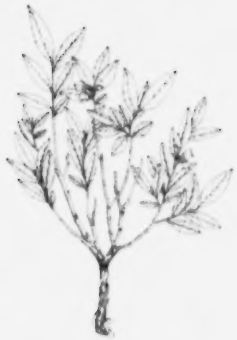
- moderately browsed by ungulates; fruit eaten by birds. (40, 58)

Vaccinium membranaceum – black huckleberry

Indicator Values and Species Notes

- grows on sites with at least moderate snow cover and without significant moisture stress in the summer. (25)
- commonly found on soils with mor humus forms.
- shade neutral, grows well and flowers more often in partial shade than in other light conditions. (25, 42)
- after low- and moderate-intensity fires, the rhizomes resprout; after severe-intensity fires, resprouting is significantly reduced. (1, 25, 74)
- present in all seral stages. (18)
- browsed by bears, ungulates, foxes, hares, small mammals, and grouse; berries eaten by bears, small mammals, and birds. (8, 22, 25, 40, 73)





Vaccinium myrtilloides – velvet-leaved blueberry

Indicator Values and Species Notes

- not observed in ICHmc, ICHmk, ICHwc, ICHvk2, and ICHvc.
- common on soils with mor humus forms.
- shade tolerant; persists in full shade, berry production is highest in partial shade. (43)
- after low- to moderate-intensity fires, resprouts from rhizomes and stem bases, increases in abundance on dry and mesic sites. (69)
- low- to moderate-intensity late-fall burns increase fruit production and cover, spring and winter burns increase cover, mid-summer burns reduce cover and fruit production. (69)
- repeated burning at 2-year intervals reduces cover. (69)
- slow growth response to overstorey removal from harvesting. (43)
- increases in abundance after forest canopy thinning. (69)
- browsed by ungulates; berries eaten by bears, small mammals, and birds. (22, 61)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

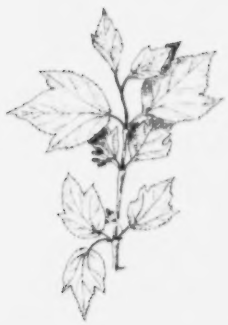
Vaccinium ovalifolium – oval-leaved blueberry

Indicator Values and Species Notes

- intolerant of summer drought and high summer temperatures. (25)
- grows well in partial shade and full sunlight, persists in deep shade. (25)
- after site disturbance, low- to moderate-intensity fires, or browsing, resprouts from rhizomes. (69)
- persists in abundance in pioneer seral stage, present in all seral stages. (18)
- berry production can be reduced for up to 5 years after site disturbance. (69)
- slow response in vigour after overstorey removal and increased light availability. (43)
- browsed by ungulates and grouse; berries eaten by bears, small mammals, and birds. (8, 22, 25, 73)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

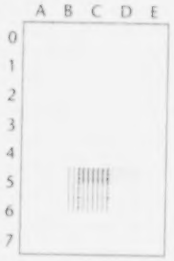


Viburnum edule – highbush-cranberry

Indicator Values and Species Notes

- distribution limited by high summer temperatures and humidity. (25)
- tolerant of heavy frosts. (25)
- preference for nitrogen-rich soil. (35)
- shade intolerant, grows well in full sunlight, persists in partial shade. (25, 69)
- persists in abundance in pioneer seral stage, present in all seral stages. (18)
- after site disturbance and low- to moderate-intensity fires, resprouts from rootstock. (69)
- browsed by ungulates, rabbits, and beavers; berries eaten by bears, small mammals, and birds. (8, 22, 25, 40, 58, 61, 73)

MSxv
MSdc,dv



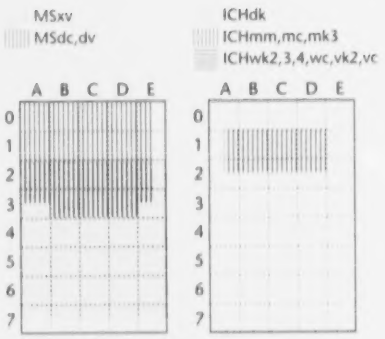
ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Herbs, Ferns, and Dwarf Shrubs

Achillea millefolium – yarrow

Indicator Values and Species Notes

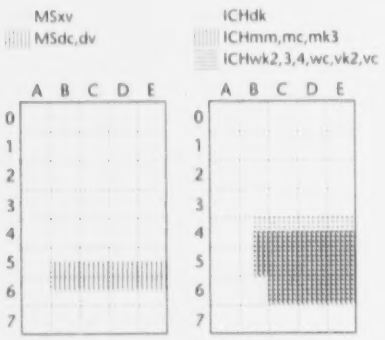
- shade intolerant, grows well in full sunlight, persists in partial shade in drier subzones. (42, 53)
- after fire and site disturbance, sprouts from rhizomes. (9, 53)
- associated with mineral soil exposure.
- increases in abundance in pioneer and young seral forests. (42)
- grazed by bears, deer, and bighorn sheep. (22, 61)



Actaea rubra – baneberry

Indicator Values and Species Notes

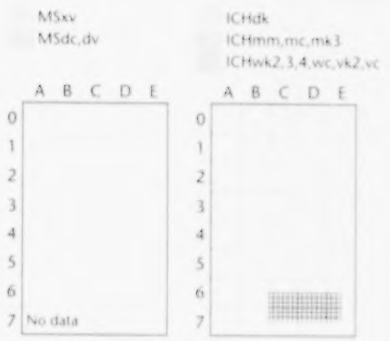
- preference for nitrogen-rich soil. (35)
- shade neutral, grows well in deep shade to full sunlight. (35)
- after fire, sprouts from underground caudex and re-establishes with animal-transported seed. (9)
- persists in abundance in pioneer seral stage and in deciduous, mature seral forests. (18)
- fruit eaten by birds and small mammals. (69)
- poisonous to humans. (46)



Adenocaulon bicolor – pathfinder

Indicator Values and Species Notes

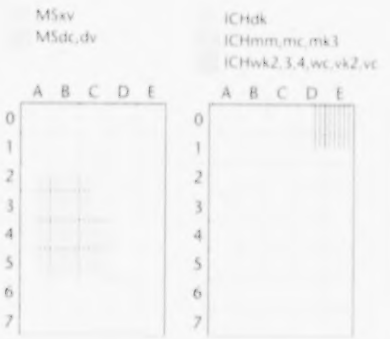
- not observed in ICHmc, ICHwc, and ICHvc; uncommon in ICHmk3 and ICHwk2.
- preference for nitrogen-rich soil. (35)
- shade tolerant; grows well in partial shade, persists in full shade. (46, 64)
- decreased by fire and other site disturbances, slow re-establishment from transported seed. (9, 44)



Agoseris glauca – short-beaked agoseris

Indicator Values and Species Notes

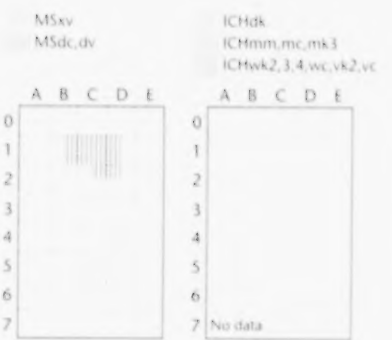
- not observed in ICHmm and ICH mk3.
- increases in abundance after canopy removal.
- grazed by deer. (61)



Allium cernuum – nodding onion

Indicator Values and Species Notes

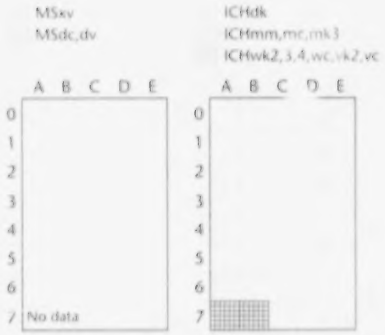
- shade intolerant, grows well in full sunlight, persists in partial shade. (35)
- preference for slopes on warm aspects.
- persists in abundance in pioneer seral stage.
- grazed by bears. (22)



Andromeda polifolia – bog-rosemary

Indicator Values and Species Notes

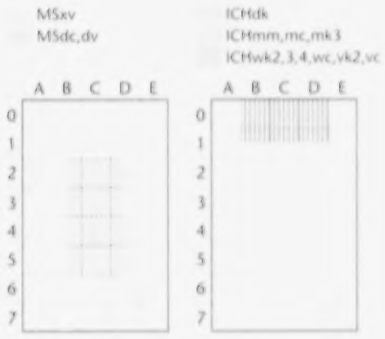
- wetland indicator species. (35, 52)
- commonly found on saturated humus forms overlying organic and gleysolic soil orders.
- typically occurs on acidic bog-like wetlands.
- shade intolerant, grows well in full sunlight. (35)
- recovers slowly after fire and attains greatest abundance 50–250 years after disturbance. (30)
- poisonous to humans and livestock. (46)



Anemone multifida – cut-leaved anemone

Indicator Values and Species Notes

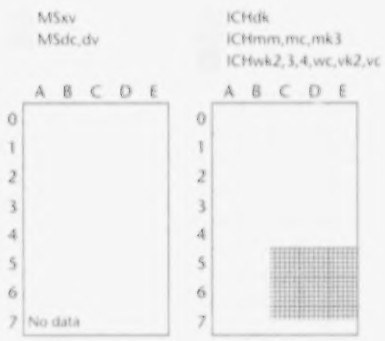
- not observed in ICHmm, ICHmk3, and ICHvc.
- shade intolerant; grows well in full sunlight and persists in partial shade. (46)
- moderate grazing value for deer and sheep. (61)



Angelica genuflexa – kneeling angelica

Indicator Values and Species Notes

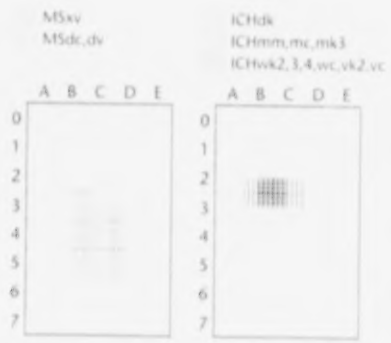
- not observed in ICHmm, uncommon in ICHmk3.
- preference for nitrogen-rich soil. (35)
- grows well in full sunlight and partial shade. (35)
- after harvesting, increases in abundance on compacted wet sites, especially on skidtrails.
- grazed by bears. (22)



Antennaria neglecta – field pussytoes; *Antennaria howellii* – Howell's pussytoes

Indicator Values and Species Notes

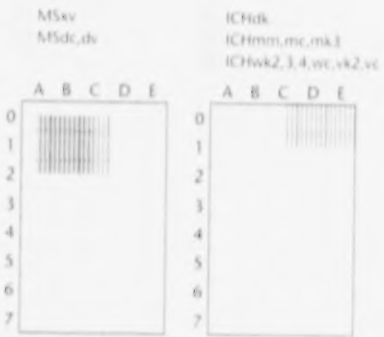
- not observed in ICHmm, ICHwc, ICHvk2, or ICHvc.
- grows well in full sunlight and partial shade. (35)
- increases edatopic grid location after canopy removal.
- grazed by deer. (61)



Antennaria rosea – rosy pussytoes

Indicator Values and Species Notes

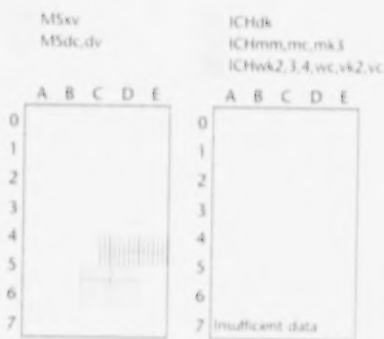
- shade intolerant, grows well in full sunlight, persists in partial shade. (65)
- after fire, establishes by wind-transported seed on exposed mineral soil. (69)
- increases in abundance in pioneer seral and young seral stages, persists in abundance in mature deciduous stands. (65, 69)
- grazed by deer. (61)



Aquilegia formosa – Sitka columbine

Indicator Values and Species Notes

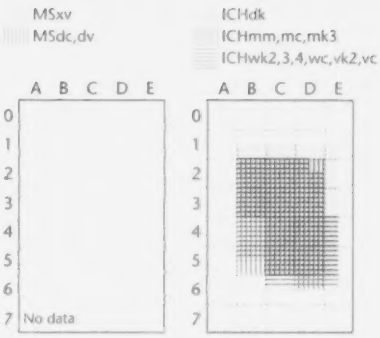
- also known as red columbine.
- preference for nitrogen-rich soils. (35)
- grows well in partial shade and full sunlight. (35)
- commonly observed on fresh to moist disturbed sites in ICH zone.
- increases in abundance in pioneer seral stage.

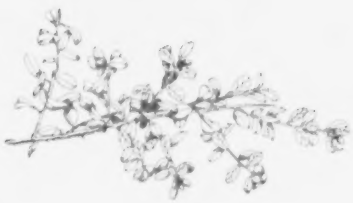


Aralia nudicaulis – wild sarsaparilla

Indicator Values and Species Notes

- shade tolerant; grows well in partial shade, persists in full sunlight. (2)
- after fire and site disturbance, resprouts from rhizomes. (2, 21, 35)
- decreases or persists in abundance in pioneer seral stage. (17)
- persists or increases in abundance in deciduous and mixedwood, young and mature forests.
- present in old forests (>200 years). (69)
- grazed by deer; berries eaten by birds and bears. (22, 69, 71)

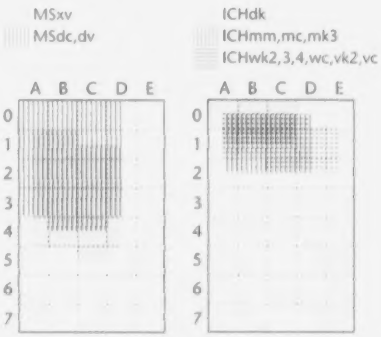




Arctostaphylos uva-ursi – kinnikinnick

Indicator Values and Species Notes

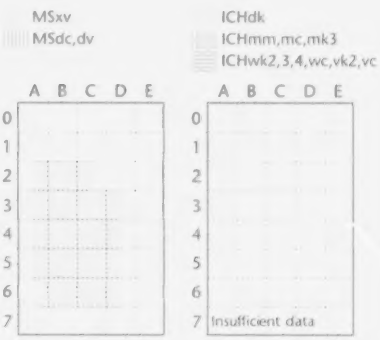
- common in shrub-carrs and frost-prone grasslands in MSxv.
- grows well in partial shade and full sunlight. (35)
- susceptible to fire; after low-intensity fires may resprout from root crowns, otherwise re-establishes by animal-transported seed. (45, 21, 69)
- persists in abundance in pioneer seral stage.
- browsed by ungulates; berries eaten by bears and birds. (22, 40, 45, 61)



Arnica cordifolia – heart-leaved arnica

Indicator Values and Species Notes

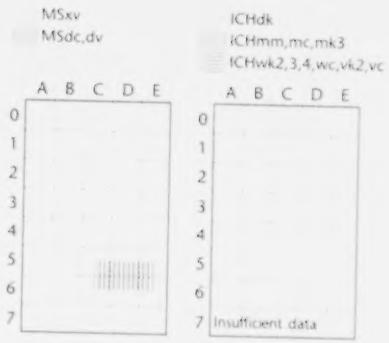
- grows well in partial shade, flowering more abundantly in full sunlight. (42, 64)
- susceptible to fire-kill, re-establishes with wind-transported seed and sprouts from rhizomes after low-intensity fires. (9, 69)
- increases in abundance in pioneer seral stage.
- grazed by deer. (71)



Arnica latifolia – mountain arnica

Indicator Values and Species Notes

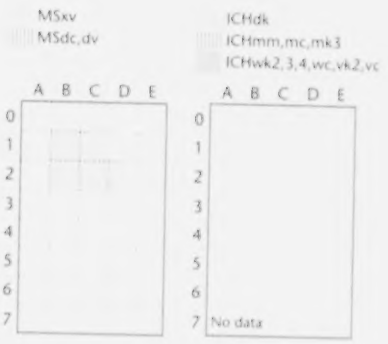
- grows well in full sunlight and partial shade. (35)
- susceptible to fire-kill, re-establishes by wind-transported seed; after low-intensity fires, resprouts from rhizomes. (9)
- increases in abundance in pioneer, young, and mature seral stages. (6)
- increased range on edatopic grid when mineral soil exposed.



Artemisia frigida – prairie sagewort

Indicator Values and Species Notes

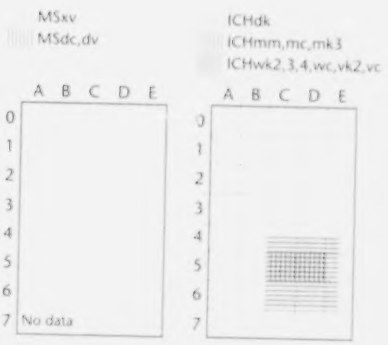
- extremely drought tolerant. (69)
- shade intolerant, grows well in full sunlight, persists in partial shade. (46, 69)
- persists or increases in abundance in pioneer seral stage. (69)
- after fire, re-establishes from on-site and wind-transported seed; after low-intensity fires, resprouts from stumps. (69)
- browsed by ungulates (bighorn and thinhorn sheep) and livestock. (40, 46,61)



Aruncus dioicus – goatsbeard

Indicator Values and Species Notes

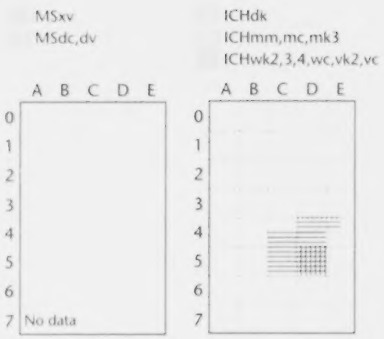
- preference for nitrogen-rich soil. (35)
- grows well in partial shade and full sunlight.
- persists in abundance in pioneer, young, and mature seral stages. (18)



Asarum caudatum – wild ginger

Indicator Values and Species Notes

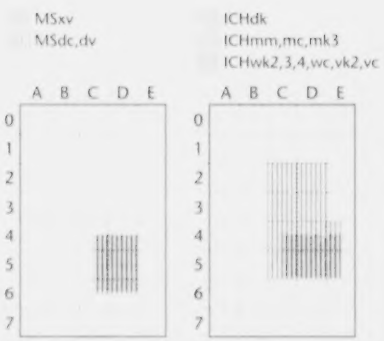
- rare in ICHmm, ICHmk3, ICHwk2, ICHwk4, and ICHwc.
- preference for nitrogen-rich soil. (35)
- shade tolerant; grows well in deep shade. (35)
- susceptible to fire-kill, higher abundance after clearcutting than after burning. (69)
- decreases in abundance after site disturbance. (44)



Aster ciliolatus – Lindley's aster

Indicator Values and Species Notes

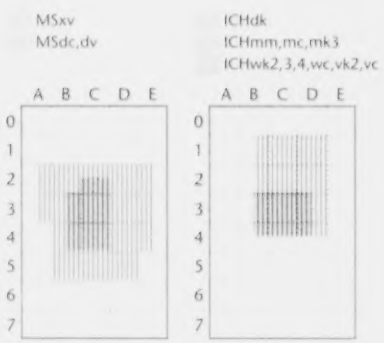
- not observed in ICHmm or ICHmc1.
- also known as fringed aster.
- shade intolerant, grows well in full sunlight, persists in partial shade. (2)
- after fire, re-establishes from wind-transported seed and sprouts from rhizomes. (2)
- increases in abundance in pioneer seral stage. (2)
- persists in abundance in young seral forests on water-shedding sites. (35)
- grazed by bears, deer, and elk; seed eaten by small mammals. (2, 8, 22, 61)



Aster conspicuus– showy aster

Indicator Values and Species Notes

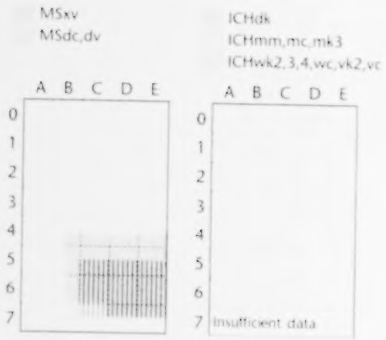
- not observed in ICHmm.
- preference for nitrogen-rich soils. (35)
- grows well in partial shade and full sunlight. (64)
- after low- to moderate-intensity fires, will resprout from rhizomes. (54, 63)
- multiple broadcast burns may promote *A. conspicuus*, which establishes by wind-transported seed. (44, 69)
- increases in abundance in pioneer and young seral stages.
- grazed by bears, deer, and elk. (8, 22, 61)



Aster foliaceus – leafy aster

Indicator Values and Species Notes

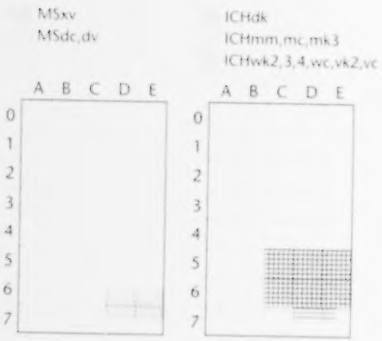
- grazed by bears, deer, and elk. (22, 61)



Aster modestus – great northern aster

Indicator Values and Species Notes

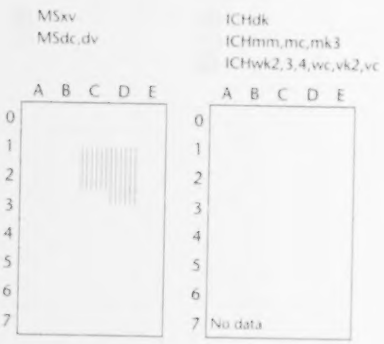
- not observed in ICHmm, ICHmc1, and ICHwc.
- typically occurs on cold, wet soils.
- grazed by bears, deer, and elk.(22,61)

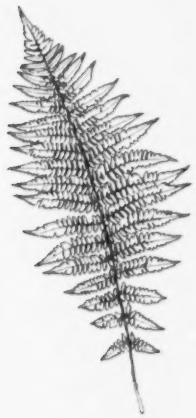


Astragalus miser – timber milk-vetch

Indicator Values and Species Notes

- in MS zone, typically is a grassland species.
- shade intolerant; grows well in full sunlight and persists in partial shade. (46)
- after fire, resprouts from tap root. (9)
- persists or increases in abundance in the pioneer seral stage. (46)
- grazed by deer and bears. (8, 22, 71)
- poisonous to livestock and humans. (46)

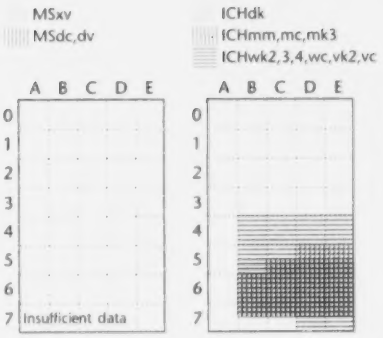




Athyrium filix-femina – lady fern

Indicator Values and Species Notes

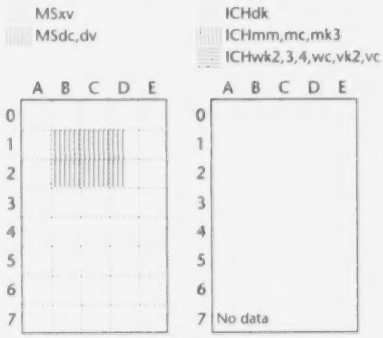
- associated with aerated water.
- fronds are sensitive to frost. (25)
- preference for nitrogen-rich soil. (35)
- grows best in partial shade and full sunlight, persists in deep shade. (25)
- after low- to moderate-intensity fires, usually increases in abundance. (25)
- in pioneer seral stage, persists and can increase in abundance on wet sites, decreases in abundance on sites that dry out after site disturbance. (25)
- present in all seral stages. (18)
- grazed by ungulates; emerging fronds (fiddleheads) eaten by bears, ungulates, and grouse. (8, 22, 25, 40)



Balsamorhiza sagittata – arrowleaf balsamroot

Indicator Values and Species Notes

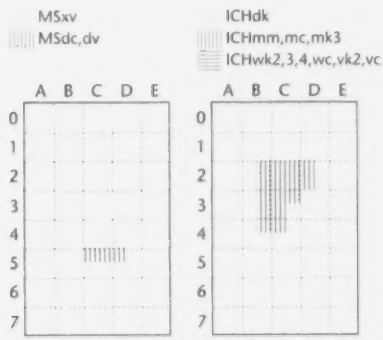
- uncommon in MSdc2 and MSdv.
- resistant to drought. (69)
- intolerant of high watertables but will tolerate short periods of soil saturation. (69)
- grows well in full sunlight and partial shade. (46, 63)
- increases in abundance after fire, resprouting from caudex. (1, 9)
- grazed by deer and livestock. (46, 61)



Calypso bulbosa – fairy-slipper

Indicator Values and Species Notes

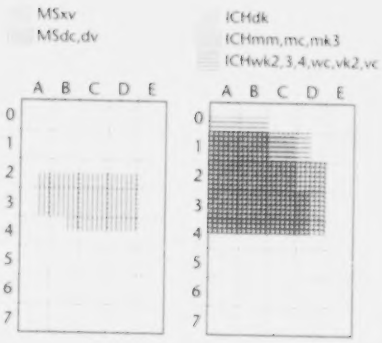
- shade tolerant, grows well in partial shade.

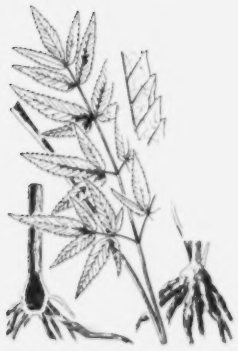


Chimaphila umbellata – prince's pine

Indicator Values and Species Notes

- grows well in partial shade and full sunlight.
- after low- to moderate-intensity fires, resprouts from rhizomes. (21)
- tends to decrease in abundance in pioneer seral stage. (1, 6, 57)
- present in old forests (>450 years). (57)

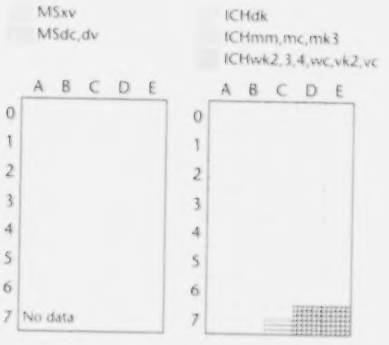


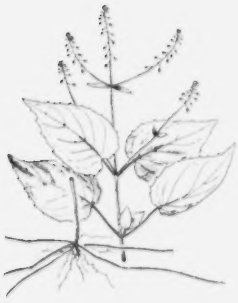


Cicuta douglasii – Douglas' water-hemlock

Indicator Values and Species Notes

- wetland indicator species, common in marshes, lakeshores, and stream edges. (52)
- commonly found on soils with saturated humus forms.
- persists in abundance in pioneer seral stage.
- grazed by bears. (22)
- poisonous to humans and livestock. (46)

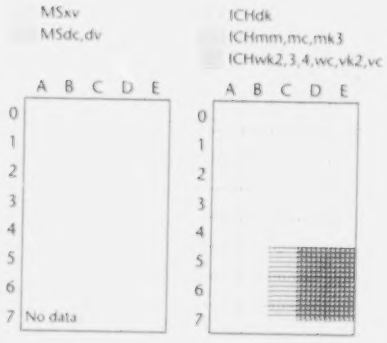


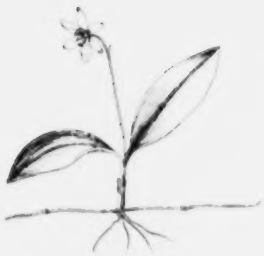


Circaea alpina – enchanter's-nightshade

Indicator Values and Species Notes

- shade tolerant, grows well in deep shade, persists in partial shade.
- decreases in abundance in pioneer and young seral stages, increases in abundance in mature seral stage. (33)
- abundant in old forests (>160 years). (68)

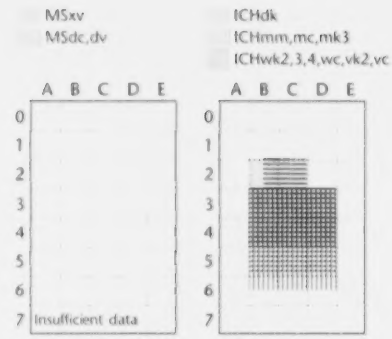


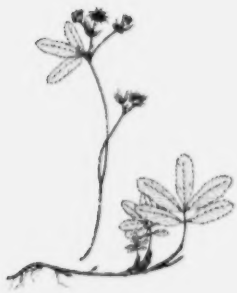


Clintonia uniflora – queen's cup

Indicator Values and Species Notes

- grows well in partial shade, persists in full sunlight.
- decreases after fire, slowly resprouts from rhizomes. (44, 54)
- decreases in abundance in pioneer seral stage; present in all seral stages. (18)
- berries eaten by grouse. (46)

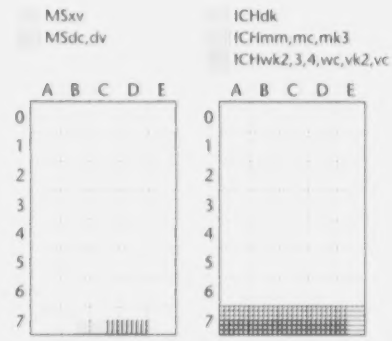




Comarum palustre – marsh cinquefoil

Indicator Values and Species Notes

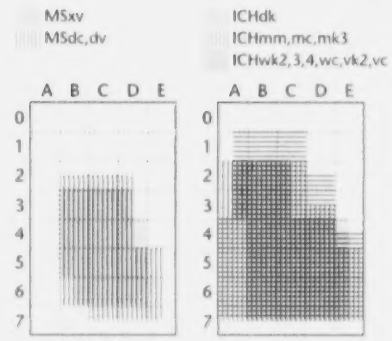
- synonym *Potentilla palustris*.
- wetland indicator species, associated with a year-round high watertable. (31, 46, 52)
- commonly found on gleysolic and organic soils orders.



Cornus canadensis – bunchberry

Indicator Values and Species Notes

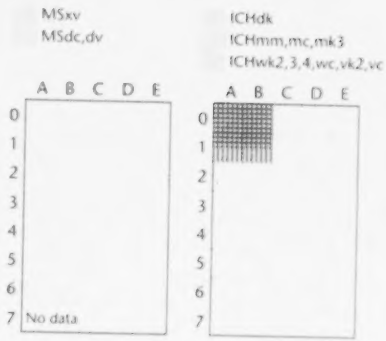
- grows well in partial shade, persists in full sunlight and deep shade. (2, 35, 69)
- after low- and moderate-intensity fires or site disturbance, resprouts from rhizomes. (2, 21, 69)
- may decrease in abundance in pioneer seral stage.
- decreases in abundance in young seral stage; increases in abundance in maturing climax and old forest, particularly in canopy gaps. (4)
- present in all seral stages. (18)
- grazed by deer; fruit eaten by small mammals and birds. (2, 71)



Cryptogramma acrostichoides – parsley fern

Indicator Values and Species Notes

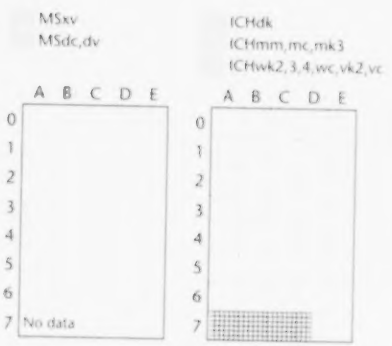
- not observed in ICHmm, ICHvk2, and ICHvc.
- commonly found on rapidly drained soils, rocky outcrops, and talus slopes.
- shade intolerant, grows well in full sunlight.



Drosera spp. – sundews

Indicator Values and Species Notes

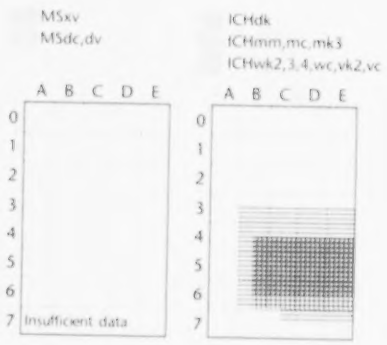
- *D. anglica* and *D. rotundifolia* are wetland indicator species. (52)
- commonly found on organic soil orders with saturated mor humus forms.
- *D. rotundifolia* is restricted to sites with a high watertable. (52)
- *D. rotundifolia* tolerant of flooding for several weeks, but can survive only short dry periods. (69)
- *D. rotundifolia* prefers acidic, nutrient-poor soils. (35)
- shade intolerant, grows well in full sunlight. (35)
- insectivorous plant.

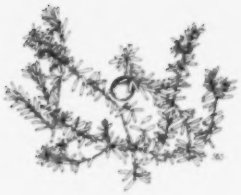


Dryopteris expansa – spiny wood fern

Indicator Values and Species Notes

- synonym *D. assimilis*.
- often associated with decaying wood. (35)
- grows well in partial shade and full sunlight, persists in deep shade. (70)
- decreases in abundance in pioneer seral stage; present in all seral stages. (18)
- emerging fronds (fiddleheads) eaten by bears. (8)

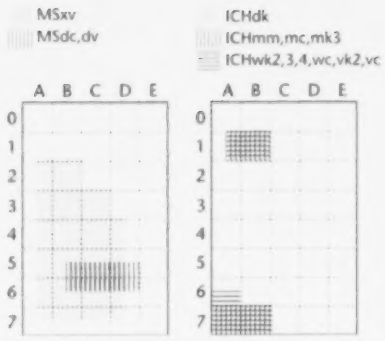




Empetrum nigrum – crowberry

Indicator Values and Species Notes

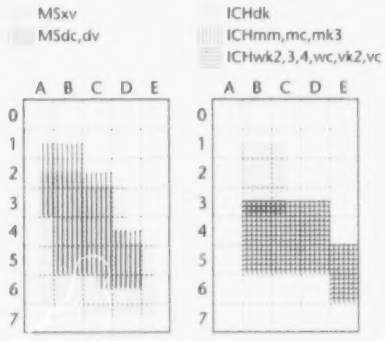
- not observed in MSdc1, ICHmk3, ICHwk4, or ICHvk2; occurs only on dry sites in ICHmc.
- intolerant of prolonged saturated soils; inhabits better drained microsites on wet sites. (69)
- often found on nitrogen-poor soils. (35)
- shade tolerant, grows well in partial shade.
- slow to recover following fire. (69)
- after low-intensity fires and site disturbance, persists in abundance in pioneer seral stage, increases in abundance in maturing climax seral stage. (32, 69)
- plants growing in shade initially decline in cover and vigour following canopy removal.
- fruit eaten by bears, birds, and small mammals. (8, 22, 69)



Epilobium angustifolium – fireweed

Indicator Values and Species Notes

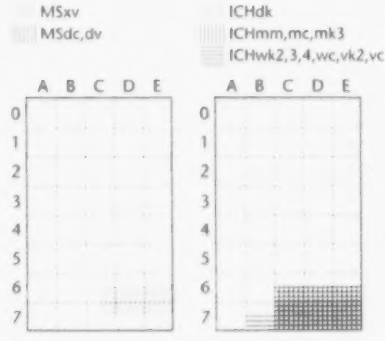
- intolerant of saturated soils. (25)
- shade intolerant; grows well in full sunlight, persists in partial shade. (35)
- after fire or site disturbance, rapidly establishes from wind-transported seed and sprouts from rhizomes. (2, 10, 16, 35)
- large increases in abundance in pioneer seral stage and increases in range on edatopic grid. (64)
- decreases in abundance in young seral stands unless there are openings. (69)
- increases in abundance after light underburning. (13)
- persists in small amounts in old forests (>200 years), often on disturbed microsites. (10)
- spring foliage browsed by ungulates, bears, and hares; browsed throughout the growing season by cattle and sheep; seed eaten by small mammals; nectar sought by birds, bees, and insects. (2, 8, 25, 61, 73)



Epilobium ciliatum – purple-leaved willowherb

Indicator Values and Species Notes

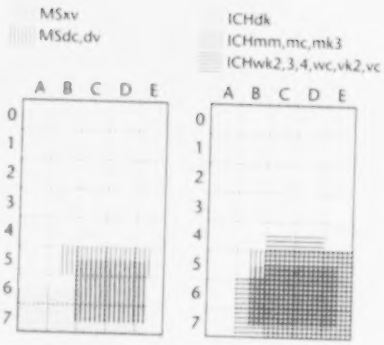
- grows well in full sunlight and partial shade, persists in deep shade.
- increases in abundance and vigour in pioneer seral stage. (46)
- persists in all seral stages.
- grazed by moose and elk. (61)



Equisetum arvense – common horsetail

Indicator Values and Species Notes

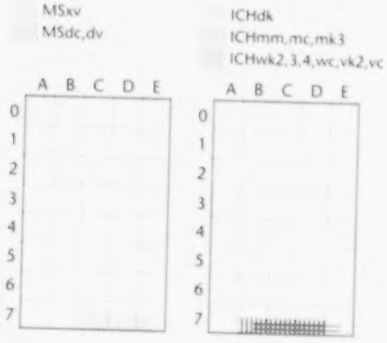
- commonly occurs on moist to wet disturbed sites. (35)
- shade intolerant, grows well in full sunlight, persists in partial shade. (35, 70)
- after fire, resprouts from rhizomes. (16)
- may increase in abundance and range on edatopic grid to much drier moisture range in pioneer seral stage. (35, 70)
- present in all seral stages. (18)
- grazed by ungulates, bears, and hares. (8, 22, 61, 71, 73)



Equisetum fluviatile – swamp horsetail

Indicator Values and Species Notes

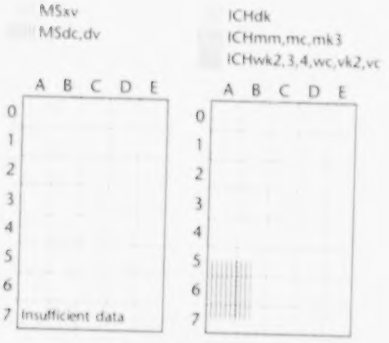
- commonly found on saturated mor and moder humus forms overlying gleysolic and organic soil orders.
- occurs in nutrient-rich marshes or lake edges in standing water less than 60 cm deep. (70, 31)



Equisetum hyemale – scouring-rush

Indicator Values and Species Notes

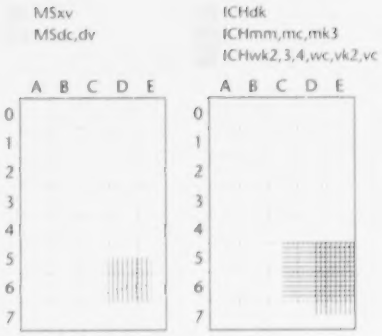
- grows well in partial shade and full sunlight. (35)



Equisetum pratense – meadow horsetail

Indicator Values and Species Notes

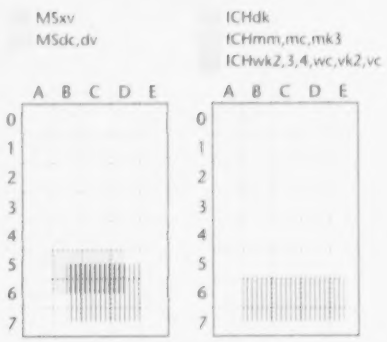
- persists or may increase in abundance and range on edatopic grid in pioneer seral stage.
- grazed by bears, hares, moose, thinhorn sheep, and caribou. (8, 22, 61, 73)



Equisetum scirpoides – dwarf scouring-rush

Indicator Values and Species Notes

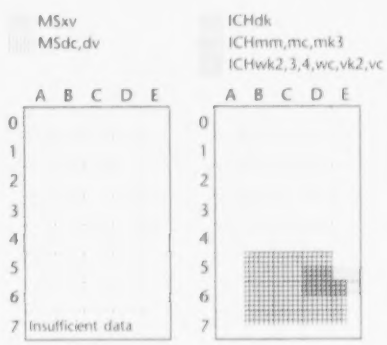
- not observed in ICHmc.
- commonly found on soils with saturated humus forms.
- may indicate growing-season frost-prone sites or decaying wood. (67)
- shade tolerant, grows well in partial shade. (70)



Equisetum sylvaticum – wood horsetail

Indicator Values and Species Notes

- shade tolerant, grows well in partial shade. (69, 70)
- decreases in abundance in pioneer seral stage.
- after fire and site disturbance, sprouts from rhizomes, re-establishes by wind-transported spores. (69)
- present in all seral stages. (69)
- grazed by bears, moose, thinhorn sheep, caribou, and hares. (22, 61, 73)



Erigeron peregrinus – subalpine daisy

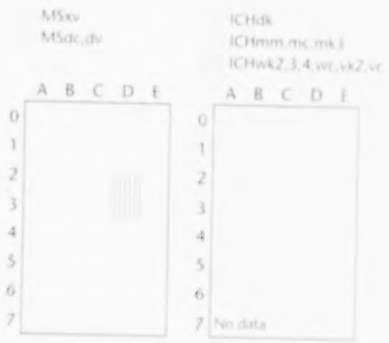
Indicator Values and Species Notes

- characteristic of alpine and open, subalpine ecosystems. (35, 46)
- common in wet forests and non-forested, wet meadows. (46)
- grows well in full sunlight and partial shade. (35)

Erigeron speciosus – showy daisy

Indicator Values and Species Notes

- shade intolerant; grows well in full sunlight and persists in partial shade. (46)
- persists in abundance in pioneer seral stage; easily established by seed. (46)



Eriogonum umbellatum – sulphur buckwheat

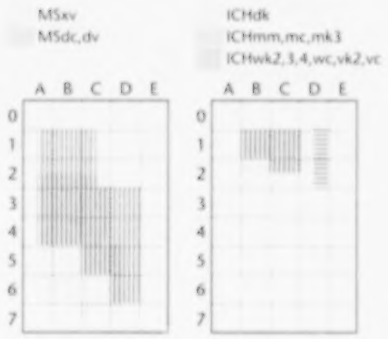
Indicator Values and Species Notes

- not observed in MSdv.
- commonly found on soils with mull humus forms.
- shade intolerant, grows well in full sunlight. (46)
- *Eriogonum* spp. are grazed by wild sheep. (61)

Fragaria virginiana – wild strawberry

Indicator Values and Species Notes

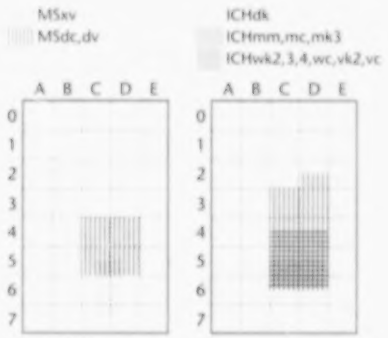
- not observed in ICHmm, ICHwc, and ICHvc.
- more frost tolerant than wood strawberry. (65)
- shade intolerant; grows well in full sunlight, persists in partial shade. (65)
- susceptible to fire-kill; after low-intensity fires will resprout from stolons. (9)
- establishes well on exposed mineral soil.
- often increases in abundance in pioneer and young seral forests. (35)
- after site disturbance, edatopic range expands to drier ecosystems.
- grazed by deer; fruit eaten by bears, small mammals, and birds. (8, 22, 71)



Galium boreale – northern bedstraw

Indicator Values and Species Notes

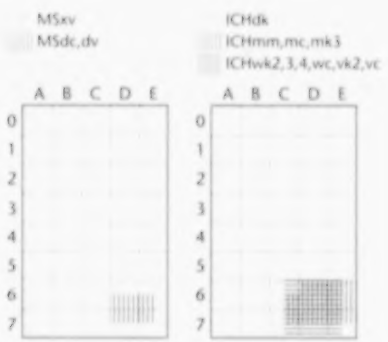
- not observed in ICHvc.
- grows well in full sunlight and partial shade.
- often increases in abundance after site disturbance and with partial canopy removal. (53)
- grazed by deer. (71)



Galium trifidum – small bedstraw

Indicator Values and Species Notes

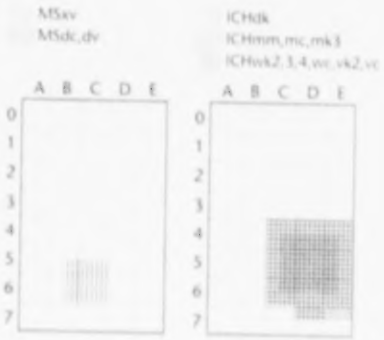
- not observed in MSdc1.



Galium triflorum – sweet-scented bedstraw

Indicator Values and Species Notes

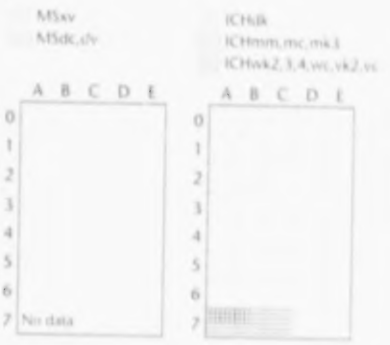
- preference for nitrogen-rich soil. (35)
- shade tolerant, grows well in partial shade. (64)
- susceptible to fire-kill; after low-intensity spring or fall fires sprouts from rhizomes. (16)
- decreases or persists in abundance in pioneer seral stage; persists in abundance in young seral stage. (18, 19, 64)
- present in all seral stages. (64)
- grazed by deer. (71)



Gaultheria hispidula – creeping-snowberry

Indicator Values and Species Notes

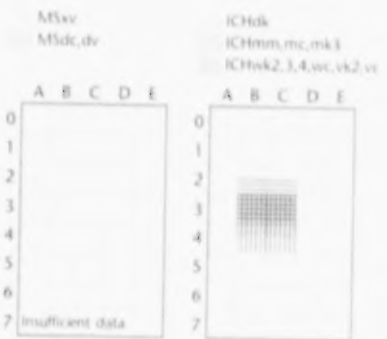
- not observed in ICHwc and ICHvc.
- typically associated with sphagnum moss or rotting logs. (46)
- commonly found on soils with saturated humus forms.
- preference for nitrogen-poor soils.
- shade tolerant, grows well in partial shade.
- decreases in abundance in pioneer seral stage.
- grouse feed on berries. (58)



Geocaulon lividum – false toad-flax

Indicator Values and Species Notes

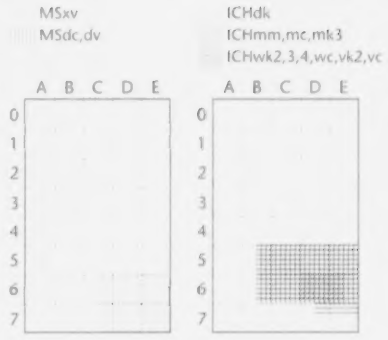
- not observed in ICHvk2.
- shade tolerant, grows well in partial shade.
- persists or may decrease in abundance in pioneer seral stage.
- alternate host for Comandra blister rust (*Cronartium comandrae*).



Geum macrophyllum – large-leaved avens

Indicator Values and Species Notes

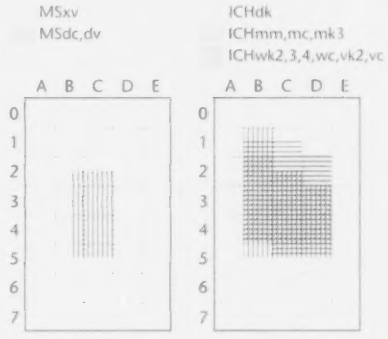
- associated with seepage and fluctuating water-tables. (34)
- preference for nitrogen-rich soil. (34)
- grows well in full sunlight, persists in partial shade. (34)
- may increase or persist in abundance in pioneer seral stage. (34)
- may increase range on edatopic grid if mineral soil is exposed in pioneer seral stage.



Goodyera oblongifolia – rattlesnake-plantain

Indicator Values and Species Notes

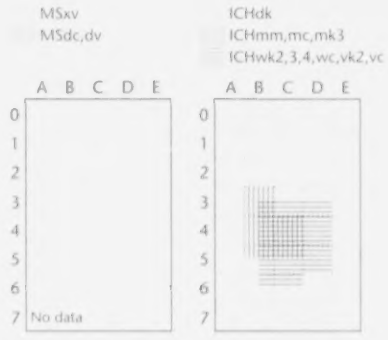
- on nutrient-rich sites, grows on decaying wood. (35)
- shade tolerant; grows well and flowers more often in partial shade than other light conditions. (42)
- after fire and site disturbance, decreases in abundance. (6, 19, 42, 44)
- present in old forests (>450 years). (57)

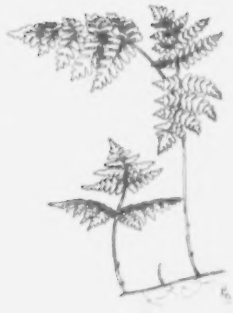


Goodyera repens – dwarf rattlesnake orchid

Indicator Values and Species Notes

- not observed in ICHwc and ICHvc.
- shade tolerant, grows well in partial shade. (2)
- decreases in abundance in early seral stage, increases in abundance in mature seral stage. (17)
- killed by fire; shallow rhizomes do not survive burning. (69)
- present in old forests (350 years). (69)

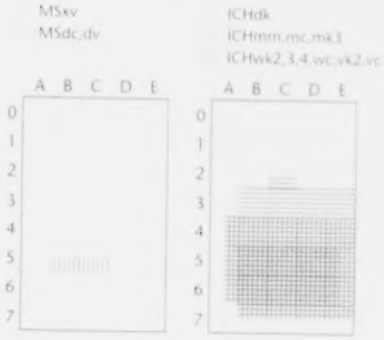




Gymnocarpium dryopteris – oak fern

Indicator Values and Species Notes

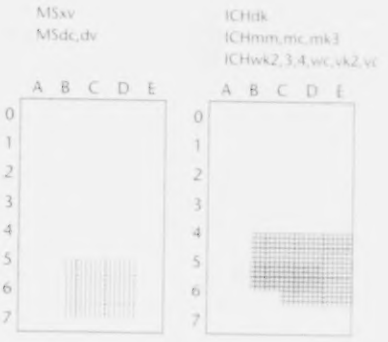
- not observed in MSdv.
- typically associated with seepage and other moist site conditions.
- shade tolerant, grows well in partial shade, persists in deep shade.
- decreases in abundance and range on edatopic grid in pioneer seral stage.
- decreases in abundance with clearcutting; persists in abundance with shelterwood (10–15% stand retained). (27)
- present in all seral stages; increases in abundance in mature seral stage; abundant in old forests (>160 years). (4, 18, 68)



Heracleum maximum – cow-parsnip

Indicator Values and Species Notes

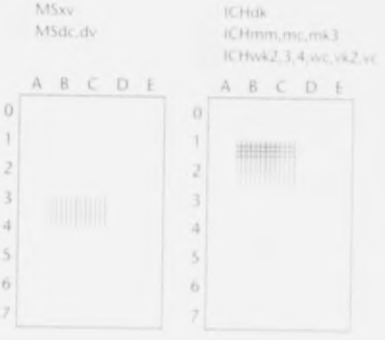
- synonym *H. lanatum*.
- often occurs with seepage or on soils with a fluctuating watertable. (35)
- tolerates heavy snow loads (e.g., avalanche chutes). (69)
- grows well in partial shade, persists in full sunlight.
- may increase in abundance in pioneer and young seral stages.
- grazed by livestock, and grizzly and black bears; fruit eaten by bears, small mammals, and birds. (2, 8, 22)



Hieracium albiflorum – white hawkweed

Indicator Values and Species Notes

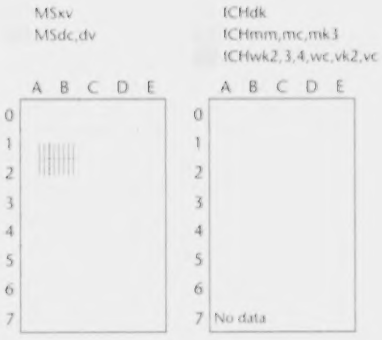
- not observed in ICHvc.
- grows well in full sunlight and persists in partial shade.
- increases in abundance and range on edatopic grid in pioneer seral stage, especially where mineral soil has been exposed; also present in other subzones (e.g., ICHvk2) on disturbed soils. (19, 57)



Hieracium scouleri – Scouler's hawkweed

Indicator Values and Species Notes

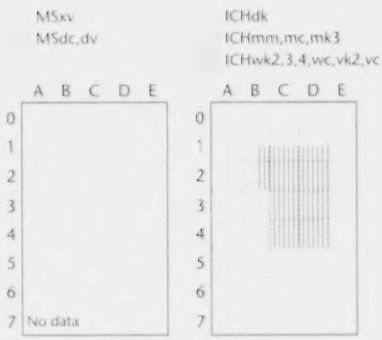
- shade intolerant, grows well in full sunlight.(46)



Lathyrus nevadensis – purple peavine

Indicator Values and Species Notes

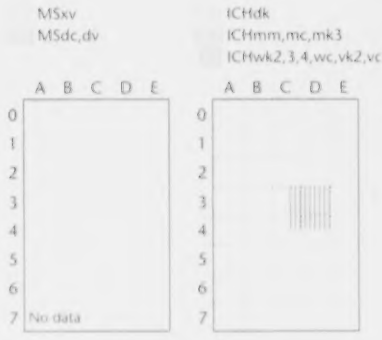
- not observed in ICHmm.
- forms a symbiotic relationship with nitrogen-fixing bacteria, enhancing the supply of available soil nitrogen. (35)
- grows well in partial shade, persists in full sunlight. (64)
- susceptible to fire-kill; after low-intensity fires resprouts from rhizomes. (16)
- may increase in abundance in pioneer and young seral stages and in deciduous or mixed-wood mature seral stages. (35)
- occurs in seral stands in ICHdk.



Lathyrus ochroleucus – creamy peavine

Indicator Values and Species Notes

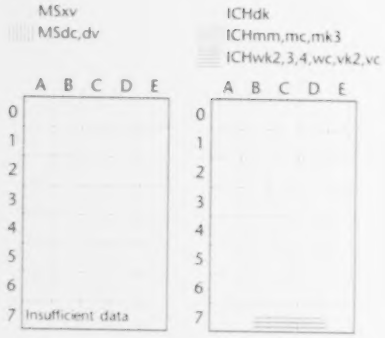
- not observed in ICHmm and ICHmc1.
- roots support nitrogen-fixing bacteria, enhancing the supply of available soil nitrogen. (35)
- grows well in full sunlight and in partial shade.
- susceptible to fire-kill; after low-intensity fires can resprout from rhizomes. (16)
- persists or may increase in abundance in pioneer and young seral stages.
- often abundant in mesic and near-mesic, deciduous, mature seral forests.
- grazed by bears and wild and domestic ungulates. (22)



Leptarrhena pyrolifolia – leatherleaf saxifrage

Indicator Values and Species Notes

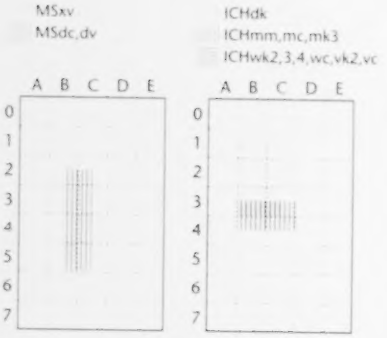
- not present in ICHwc and ICHvc.
- typically a subalpine and alpine species. (35, 46)
- shade intolerant, grows well in full sunlight.

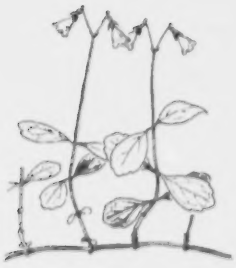


Lilium columbianum – tiger lily

Indicator Values and Species Notes

- not observed in MSdv, ICHmm, and ICHmc.
- shade intolerant; grows well in full sunlight, persists in partial shade.
- increases in abundance in pioneer and young seral stages.
- occurs in ICHwk2 and ICHwk4 after site disturbance.
- characteristic of open-canopy, young seral forests. (35)

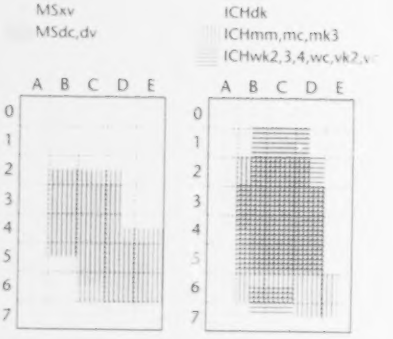




Linnaea borealis – twinflower

Indicator Values and Species Notes

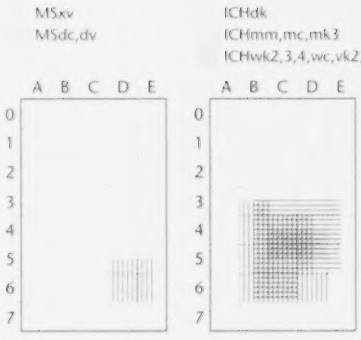
- on wet sites shows a preference for raised microsites. (35)
- on nutrient-rich sites grows on decaying wood. (35)
- shade tolerant, grows well and flowers more in partial shade, persists in deep shade. (2, 42)
- susceptible to fire-kill; re-establishes with transported seed. (1, 45)
- persists in abundance in pioneer seral stage when site disturbance in minimal; otherwise decreases in abundance. (19, 57)
- abundance increases in mature seral stands; present in old forests (>450 years). (17, 57)
- grazed by deer. (69)



Listera cordata – heart-leaved twayblade

Indicator Values and Species Notes

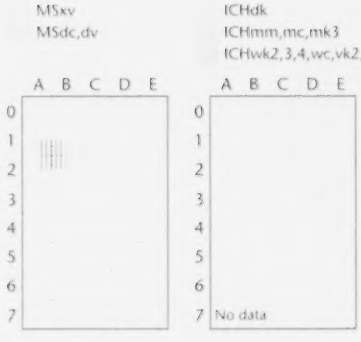
- shade tolerant, grows well in deep and partial shade.



Lithospermum ruderale – lemonweed

Indicator Values and Species Notes

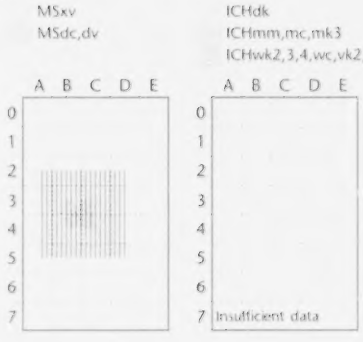
- shade intolerant, grows in full sunlight and persists in partial shade. (46)

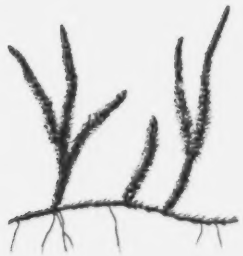


Lupinus arcticus – arctic lupine

Indicator Values and Species Notes

- roots support nitrogen-fixing bacteria, enhancing the supply of available soil nitrogen. (35)
- grows well in full sunlight and partial shade. (35)
- increases in abundance in pioneer and young seral stages.
- grazed by ungulates, bears, marmots, and other rodents. (46, 22, 40, 61)

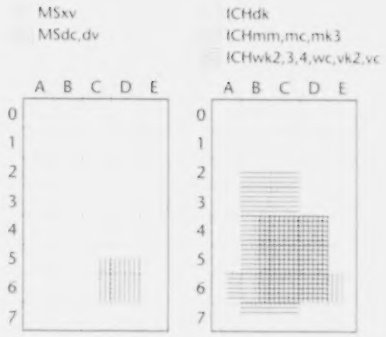




Lycopodium annotinum – stiff club-moss

Indicator Values and Species Notes

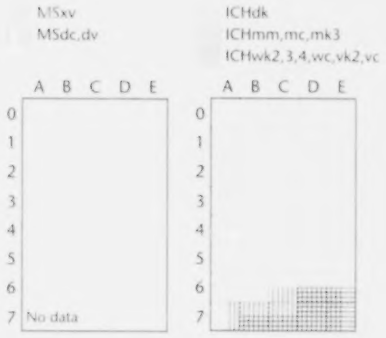
- shade tolerant; grows well in partial shade, persists in deep shade and full sunlight. (70)
- decreases in abundance in pioneer seral stage.
- fire-sensitive species, killed by all but very low-intensity fires; after fire and site disturbance, resprouts from rhizomes. (69)
- present in old forests (>160years). (68)



Lysichiton americanus – skunk cabbage

Indicator Values and Species Notes

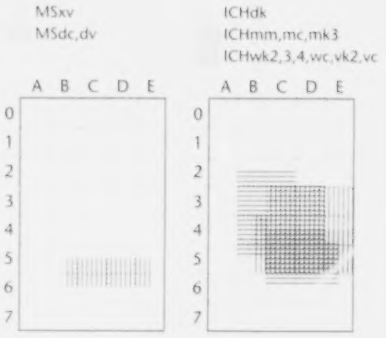
- rare in ICHwk4.
- associated with high watertables; sensitive to trampling and changes in the watertable. (35)
- commonly found on saturated mor and moder humus forms over organic and gleysolic soil orders.
- grows well in partial shade and full sunlight.
- persists or may decrease in abundance in pioneer seral stage.
- grazed by bears. (22)



Maianthemum racemosum – false Solomon's-seal

Indicator Values and Species Notes

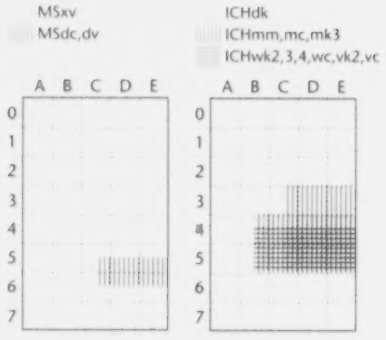
- synonym *Smilacina racemosa*.
- preference for nitrogen-rich soil. (35)
- grows well in partial shade and full sunlight.
- after low-intensity fires, sprouts from rhizomes; may be killed by severe-intensity fires. (9)
- increases in abundance on mesic and moist sites in ICH following site disturbance.
- present in all seral stages. (18)



Maianthemum stellatum – star-flowered false Solomon's-seal

Indicator Values and Species Notes

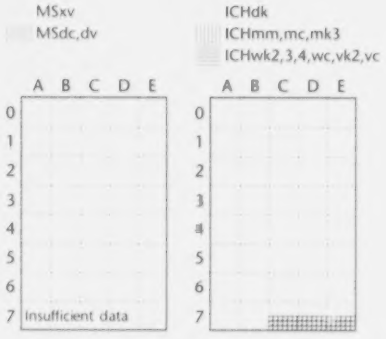
- not observed in ICHmm.
- synonym *Smilacina stellata*.
- preference for nitrogen-rich soils. (35)
- grows well in partial shade and full sunlight.
- after low-intensity fires, sprouts from rhizomes; often reduced abundance after fire. (9, 44)
- after site disturbance, decreases or persists in abundance in pioneer seral stage.
- often abundant in deciduous, mature seral stage.
- grazed by bears. (14)



Mentha arvensis – field mint

Indicator Values and Species Notes

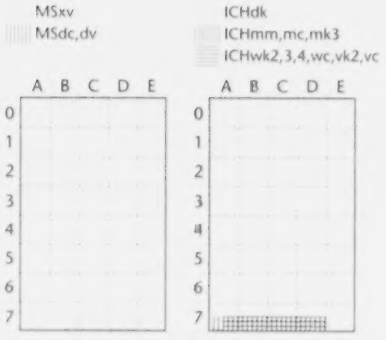
- commonly found on soils with mulls or saturated humus forms.
- frequently occurs on moist sites adjacent to lakes, streams, and wetlands.



Menyanthes trifoliata – buckbean

Indicator Values and Species Notes

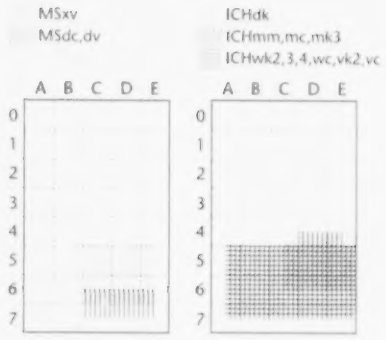
- not observed in ICHwc.
- wetland indicator species. (35, 52)
- commonly found on soils with saturated mor humus forms. (31)
- occurs on poorly drained to saturated soils, usually organic soil orders, and occasionally on gleysolic soil orders.
- shade intolerant, grows well in full sunlight. (35)
- grazed by bears. (8)



Mitella nuda – common mitrewort

Indicator Values and Species Notes

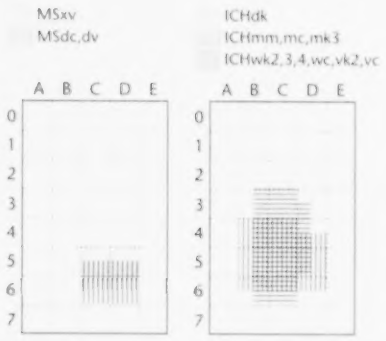
- shade tolerant, grows well in partial shade, persists in deep shade.
- decreases in abundance in pioneer seral stage.



Moneses uniflora – single delight

Indicator Values and Species Notes

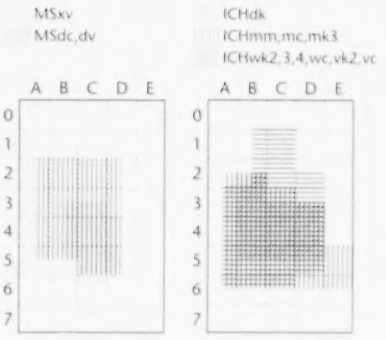
- shade tolerant, grows well in partial shade and deep shade.
- increases in abundance in old forests (>160 years). (68)

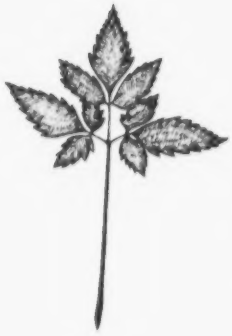


Orthilia secunda – one-sided wintergreen

Indicator Values and Species Notes

- grows well in partial shade and persists in full sunlight.
- susceptible to fire-kill; after low-intensity fires may resprout from rhizomes. (9)
- persists in abundance in unburned clearcuts; otherwise decreases in abundance in pioneer seral stage. (44)
- present in all seral stages. (18)

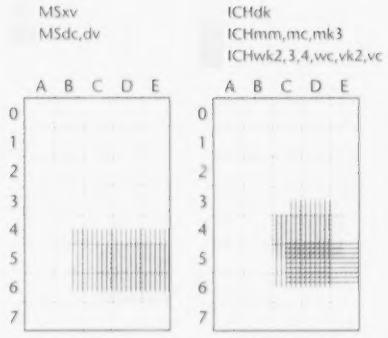


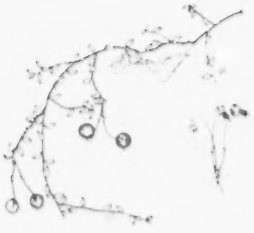


Osmorhiza berteroi – mountain sweet-cicely

Indicator Values and Species Notes

- synonym *O. chilensis*.
- preference for nitrogen-rich soils. (35)
- grows well in partial shade, persists in full sunlight. (2)
- after fire, sprouts from rhizomes and re-establishes by transported seed. (2, 9)
- flowering and seed production stimulated by increased light levels (e.g., shelterwood). (20)
- increases in abundance in pioneer seral stage and in deciduous, young and mature seral stages. (2)
- entire plant eaten by bears. (8, 22)

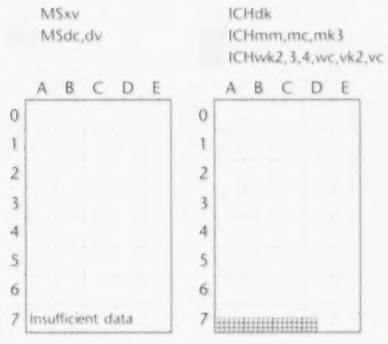




Oxycoccus oxycoccos – bog cranberry

Indicator Values and Species Notes

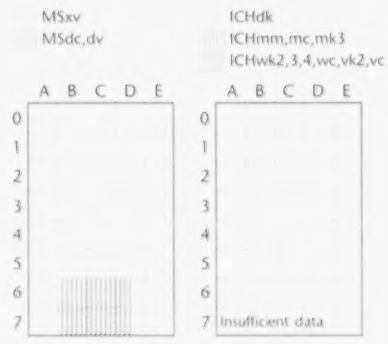
- wetland indicator species, grows in bogs and fens. (52)
- commonly found on organic surficial materials.
- associated with nutrient-poor soils.
- shade intolerant, grows well in full sunlight.
- after fire, readily resprouts from rootstocks and rhizomes, increases in abundance with repeated fires in bogs. (30, 69)
- one of first colonizers in burned bogs, generally only a relic in climax treed bogs. (69)
- berries eaten by bears, small mammals, and birds. (8, 69)



Parnassia fimbriata – fringed grass-of-Parnassus

Indicator Values and Species Notes

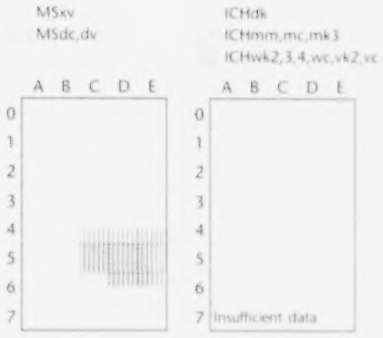
- not observed in ICHmk.
- common on soils with moder humus forms.
- shade intolerant, grows well in full sunlight and persists in partial shade. (35)
- increases in abundance in pioneer seral stage in seepage areas.



Pedicularis bracteosa – bracted lousewort

Indicator Values and Species Notes

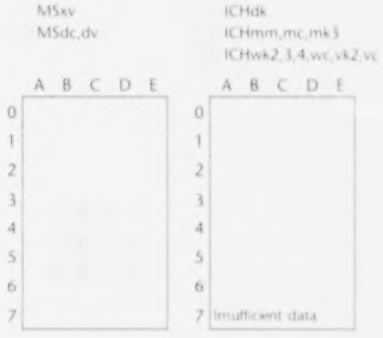
- predominantly a subalpine and alpine species. (46)
- shade intolerant; grows well in full sunlight and persists in partial shade.
- persists in abundance in pioneer seral stage



Penstemon procerus – small-flowered penstemon

Indicator Values and Species Notes

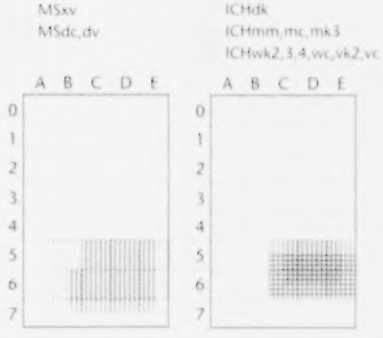
- grows well in full sunlight and partial shade.
- persists in abundance in pioneer seral stage. (46)
- grazed by ungulates. (40)



Petasites frigidus – sweet coltsfoot

Indicator Values and Species Notes

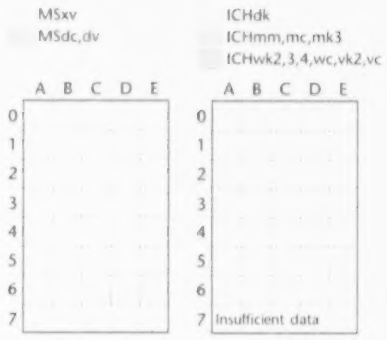
- not observed in ICHwc or ICHvc.
- includes var. *palmatus*, which occurs at low to mid elevations in the ICH and MS; and var. *nivalis*, occuring in the MS.
- preference for nitrogen-rich soil. (35)
- grows well in partial shade, persists in deep shade and full sunlight.
- persists or may increase in abundance in pioneer seral stages.



Petasites sagittatus – arrow-leaved coltsfoot

Indicator Values and Species Notes

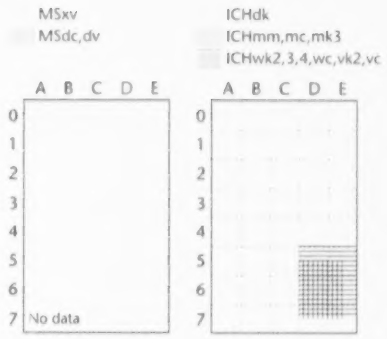
- associated with standing water. (46)
- browsed by bears. (8)



Phegopteris connectilis – narrow beech fern

Indicator Values and Species Notes

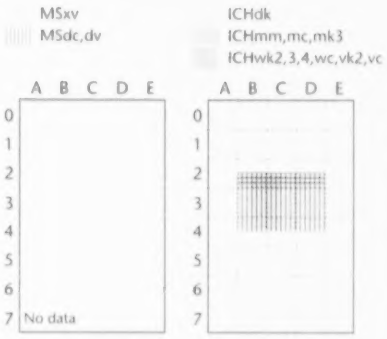
- not observed in ICHmm and ICHvc.
- synonym *Thelypteris phegopteris*.
- preference for nitrogen-rich soils with seepage. (35)
- shade tolerant, grows well in partial shade and persists in deep shade. (46)



Platanthera orbiculata – large round-leaved rein orchid

Indicator Values and Species Notes

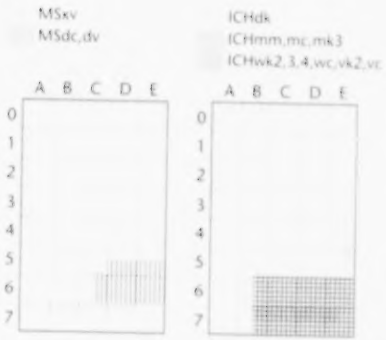
- shade tolerant, grows well in partial and deep shade.
- decreases in abundance in pioneer seral stage.

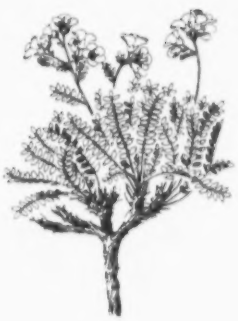


Platanthera spp. – bog-orchids

Indicator Values and Species Notes

- includes *P. dilatata*, *P. obtusata*, and *P. aquilonis*.
- characteristic of wetlands and wet seepage sites. (35)
- commonly found on organic surface material with saturated humus forms.
- shade intolerant, grows well in full sunlight and persists in partial shade. (35)

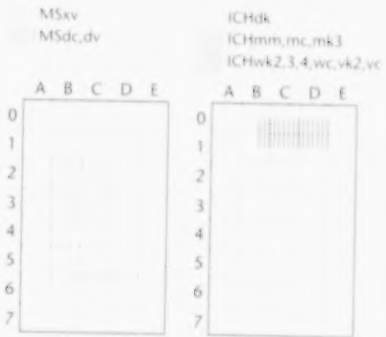




Polemonium pulcherrimum – showy Jacob's-ladder

Indicator Values and Species Notes

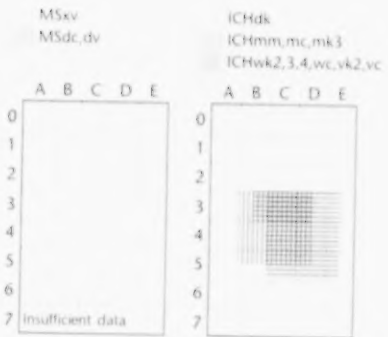
- grows well in partial shade or full sun.
- increases or persists in abundance in pioneer seral stage.



Prosartes hookeri – Hooker's fairybells

Indicator Values and Species Notes

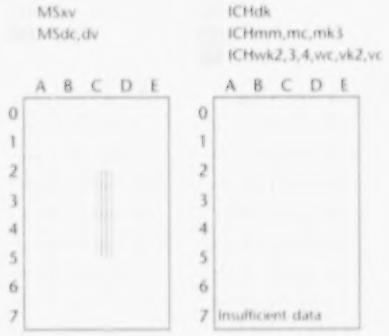
- not observed in ICHwc, ICHvc, or ICHwk4.
- synonym *Disporum hookeri*.
- preference for nitrogen-rich soil. (35)
- grows well in full sunlight and partial shade. (24, 35)
- initially decreases in abundance after fire but recovers rapidly from sprouting rhizomes. (9)
- persists in abundance in pioneer seral stage.



Prosartes trachycarpum – rough-fruited fairybells

Indicator Values and Species Notes

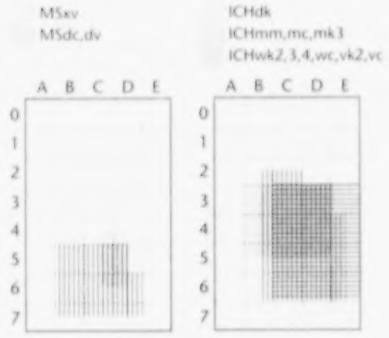
- not observed in MSdv.
- synonym *Disporum trachycarpum*.
- grows well in partial shade and full sunlight. (35)
- persists in abundance in pioneer seral stage.

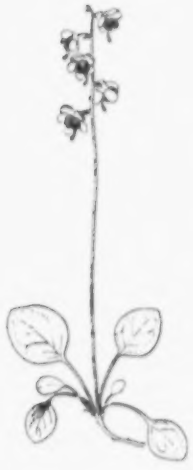


Pyrola asarifolia – pink wintergreen

Indicator Values and Species Notes

- grows well in partial shade and persists in full sunlight.
- after fire or site disturbance, decreases in abundance in pioneer seral stage. (19)
- persists in abundance in deciduous and mixedwood, mature seral stage.
- grazed by deer. (71)

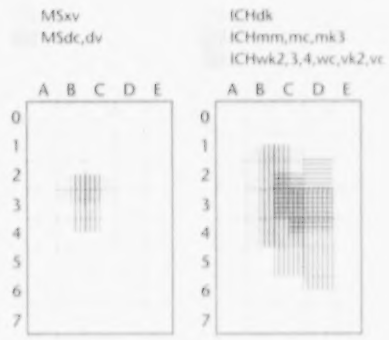




Pyrola chlorantha – green wintergreen

Indicator Values and Species Notes

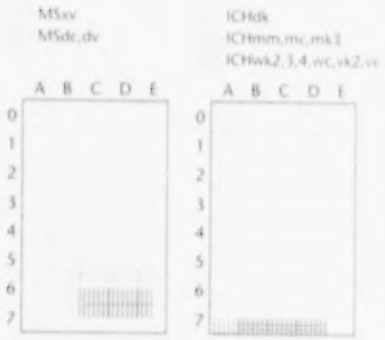
- shade tolerant, grows well in partial shade and persists in deep shade.
- decreases in abundance in pioneer seral stage.
- grazed by deer. (71)

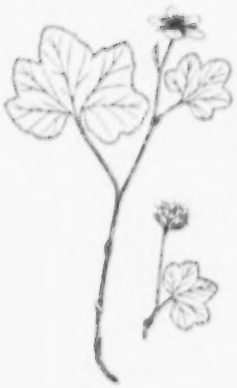


Rubus arcticus – nagoonberry

Indicator Values and Species Notes

- uncommon in ICHdk and ICHmm.
- wetland indicator species. (52)
- associated with cold, wet soils.
- after fire, resprouts from rhizomes and root-stocks. (30)

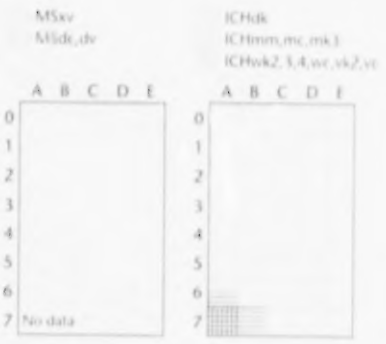




Rubus chamaemorus – cloudberry

Indicator Values and Species Notes

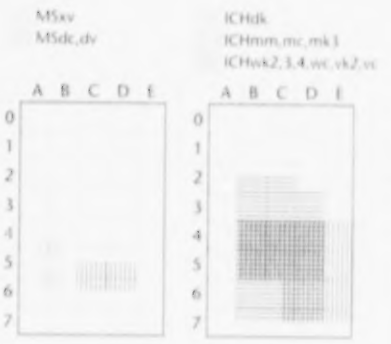
- rare in ICHmk3 and ICHwk3; uncommon in ICHmm.
- wetland indicator species. (52)
- associated with sphagnum moss.
- grows well in partial shade and full sunlight. (69)
- after low- to moderate-intensity fires, re-sprouts from rhizomes. (69)



Rubus pedatus – five-leaved bramble

Indicator Values and Species Notes

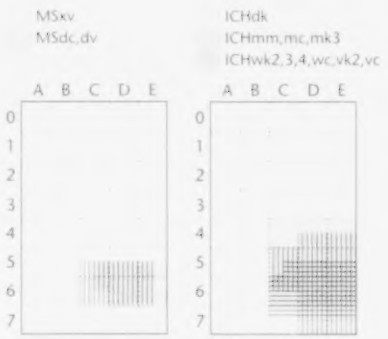
- grows well in partial shade, persists in deep shade and full sunlight. (35)
- associated with areas of deep and late-lying snow.
- may decrease or persist in abundance in pioneer seral stage. (74)
- increases in abundance in maturing climax seral stage and old forest. (74)
- occasionally grazed by ungulates. (40)



Rubus pubescens – dwarf red raspberry

Indicator Values and Species Notes

- preference for nitrogen-rich soil. (35)
- shade tolerant, grows well in partial shade. (38)
- after fire, resprouts and re-establishes by transported seed. (2)
- in pioneer seral stage, edatopic grid range increases to 3B.
- grazed by deer; fruit eaten by small mammals, birds, and bears. (2, 8, 71)



Saxifraga bronchialis – spotted saxifrage

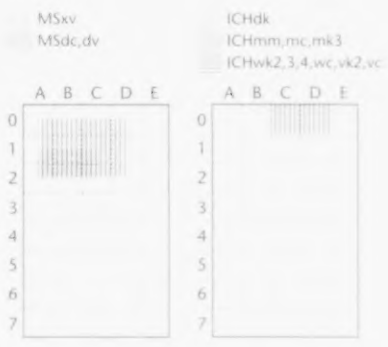
Indicator Values and Species Notes

- grows on rocky or gravelly sites. (46)
- shade intolerant, grows well in full sunlight. (46)

Sedum lanceolatum – lance-leaved stonecrop

Indicator Values and Species Notes

- found on thin soils, open, rocky ground, and on deep soils in grasslands.
- shade intolerant; grows well in full sunlight and persists in partial shade.
- grazed by deer. (71)



Senecio streptanthifolius – Rocky Mountain butterweed

Indicator Values and Species Notes

- grows well in partial shade and full sunlight.
- after fire, re-establishes from transported seed. (9)

MSxv
MSdc,dv

	A	B	C	D	E
0					
1					
2					
3					
4					
5					
6					
7					

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,vc,vk2,vc

	A	B	C	D	E
0					
1					
2					
3					
4					
5					
6					
7	No data				

Senecio triangularis – arrow-leaved groundsel

Indicator Values and Species Notes

- preference for nitrogen-rich soils. (35)
- grows well in partial shade and full sunlight.
- persists or may increase in abundance in pioneer seral stage.
- grazed by bears. (18, 22)

MSxv
MSdc,dv

	A	B	C	D	E
0					
1					
2					
3					
4					
5					
6					
7					

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,vc,vk2,vc

	A	B	C	D	E
0					
1					
2					
3					
4					
5					
6					
7					

Solidago multiradiata – northern goldenrod

Indicator Values and Species Notes

- grows well in full sunlight and partial shade. (46)

MSxv
MSdc,dv

	A	B	C	D	E
0					
1					
2					
3					
4					
5					
6					
7					

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,vc,vk2,vc

	A	B	C	D	E
0					
1					
2					
3					
4					
5					
6					
7	No data				

Solidago spathulata – spike-like goldenrod

Indicator Values and Species Notes

- grows well in full sunlight and partial shade.
- increases in abundance after site disturbance.

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Streptopus amplexifolius – clasping twistedstalk

Indicator Values and Species Notes

- preference for nitrogen-rich soil. (35)
- shade tolerant, grows well in partial shade.
- after fire and site disturbance, decreases to areas with seepage. (9, 44)
- present in all seral stages. (18)
- fruit and foliage eaten by bears. (8, 22)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Streptopus lanceolatus – rosy twistedstalk

Indicator Values and Species Notes

- synonym *Streptopus roseus*.
- preference for nitrogen-rich soils. (35)
- grows well in partial shade and full sunlight.
- persists in abundance in pioneer seral stage; present in all seral stages. (18)

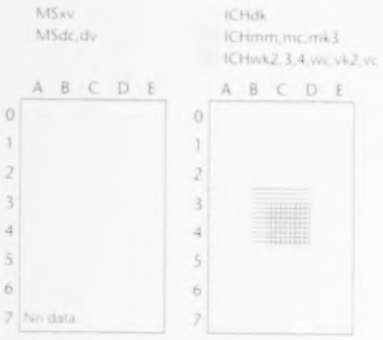
MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Streptopus streptopoides – small twistedstalk

Indicator Values and Species Notes

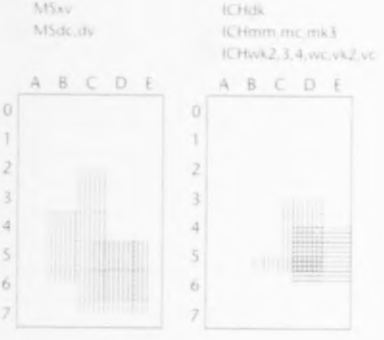
- not observed in ICHwk4, ICH mm, and ICHmk3; rare in ICHwk2.
- characteristic of areas with heavy snowfall. (46)
- shade tolerant, grows well in deep shade.



Thalictrum occidentale – western meadowrue

Indicator Values and Species Notes

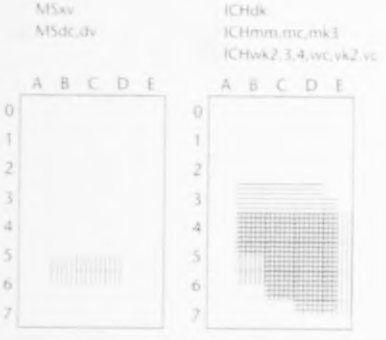
- tolerant of fluctuating watertables. (35)
- preference for nitrogen-rich soil. (35)
- grows well in partial shade, persists in full sunlight. (64)
- susceptible to fire-kill; after low-intensity fires, resprouts from surviving rhizomes. (54)
- decreases in abundance after site disturbance and fire. (44, 64)
- increases in abundance and edatopic grid range in deciduous, young and mature seral stages.



Tiarella trifoliata – three-leaved foamflower

Indicator Values and Species Notes

- includes var. *unifoliata* and var. *trifoliata*.
- preference for nitrogen-rich soils. (35)
- shade tolerant; grows well in partial shade, persists in full shade and full sunlight.
- decreases in abundance after fire. (44)
- can increase in abundance after logging in ICH zone.
- increases in abundance after thinning. (5)
- present in all seral stages. (18)
- grazed by bears. (22)

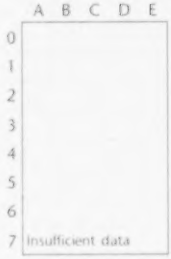


Triantha glutinosa – sticky false asphodel

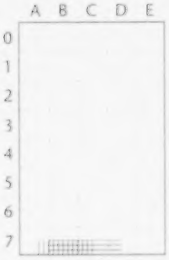
Indicator Values and Species Notes

- synonym *Tofieldia glutinosa*.
- not observed in ICHwk4.
- typically occurs in wetlands. (35)
- predominantly found on organic and gleysolic soil orders with saturated humus forms.
- shade intolerant, grows well in full sunlight. (35)

MSxv
MSdc,dv



ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc



Trientalis europaea – northern starflower

Indicator Values and Species Notes

- not observed in ICHmk3.
- predominantly found on organic and gleysolic soil orders with saturated humus forms.

MSxv
MSdc,dv

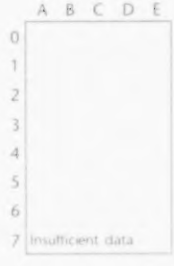
ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Urtica dioica – stinging nettle

Indicator Values and Species Notes

- intolerant of prolonged flooding. (69)
- preference for nitrogen-rich soils. (35)
- characteristic of continually disturbed sites with high nitrogen content. (35)
- grows well in partial shade, seed production increased in full sunlight. (46, 69)
- increases in abundance in pioneer and young seral stages.
- after low-intensity fires, resprouts from rhizomes. (69)
- grazed by bears in spring. (8)

MSxv
MSdc,dv

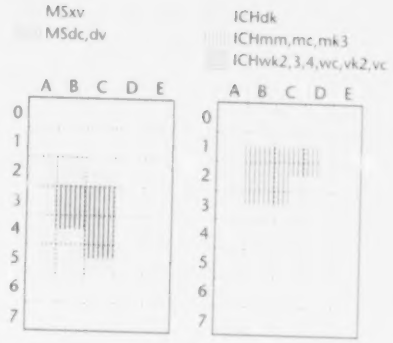


ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Vaccinium caespitosum – dwarf blueberry

Indicator Values and Species Notes

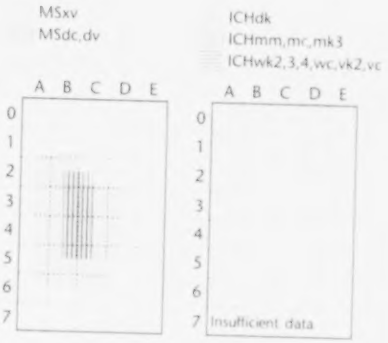
- frost tolerant. (65)
- grows and flowers in partial shade and full sunlight. (42)
- after low- to moderate-intensity fires, and low-intensity site disturbance, rhizomes resprout. (9, 45, 69)
- persists in abundance in pioneer and young seral stages.
- in ICH zone, expands to 3–5 on edatopic grid in pioneer seral stage. (7)
- browsed by ungulates; berries eaten by bears, birds, and small mammals. (8, 22, 61, 69)



Vaccinium scoparium – grouseberry

Indicator Values and Species Notes

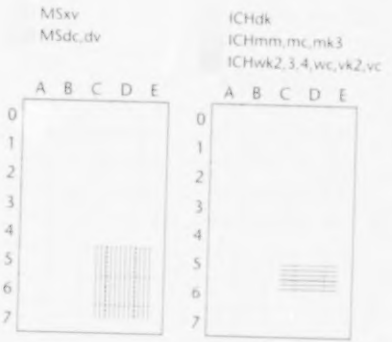
- moderately drought tolerant. (69)
- shade tolerant, grows well in partial shade.
- persists or increases in pioneer seral stage. (1)
- decreases in abundance after heavy slash treatments, site preparation or grazing. (69)
- can increase in abundance after clearcutting and light site preparation. (69)
- after low- to moderate-intensity fires, sprouts from rhizomes. (9, 45)
- browsed by ungulates; berries eaten by birds, small mammals, and bears. (8, 61, 69)



Valeriana sitchensis – Sitka valerian

Indicator Values and Species Notes

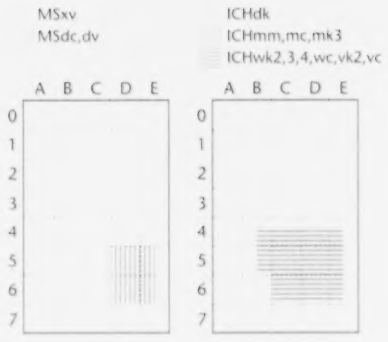
- not observed in MSdv.
- occurs in areas of cold air drainage at lower elevations. (25)
- grows well in full sunlight and partial shade. (25)
- after low- to moderate-intensity fires, rhizomes resprout; severe-intensity fires can kill rhizomes. (25)
- increases in vigour following canopy removal. (25)
- persists or increases in abundance in pioneer seral stage.
- grazed by ungulates, bears, marmots, foxes, hares, rodents, and livestock. (8, 25)



Veratrum viride – Indian hellebore

Indicator Values and Species Notes

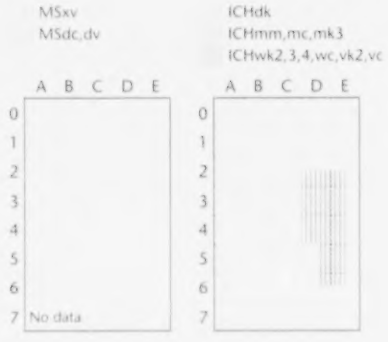
- tolerant of growing-season frosts. (67)
- occurs on cold air drainage sites in the ICH and MS zones.
- grows well in full sunlight and partial shade. (24)
- persists in abundance in pioneer, young, and maturing seral stages. (18)
- grazed by bears. (8, 22)
- poisonous to humans and domestic livestock. (46)



Viola canadensis – Canada violet

Indicator Values and Species Notes

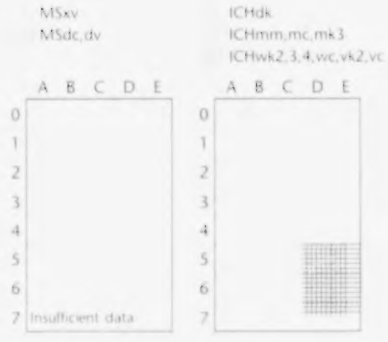
- common in moist (edatopic grid 5) hardwood stands in ICH.
- increases in abundance in pioneer seral stage. (46)



Viola glabella – stream violet

Indicator Values and Species Notes

- not observed in ICHmm.
- shade tolerant, grows well in partial shade.
- persists in abundance in pioneer seral stage.



Viola orbiculata – round-leaved violet

Indicator Values and Species Notes

- not observed in ICHvc.
- shade tolerant, grows well in partial shade, persists in deep shade.
- may decrease or persist in abundance in the pioneer seral stage.

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Viola palustris – marsh violet

Indicator Values and Species Notes

- not observed in ICHmm.
- wetland indicator species. (34, 52)
- predominantly found on organic and gleysolic soil orders.

MSxv
MSdc,dv

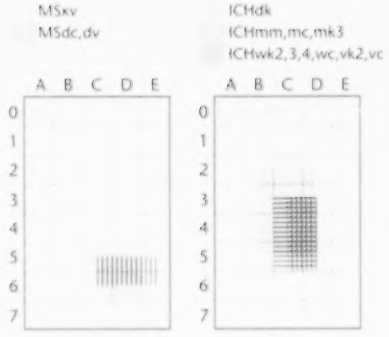
ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Grasses and Sedges

Bromus vulgaris – Columbia brome

Indicator Values and Species Notes

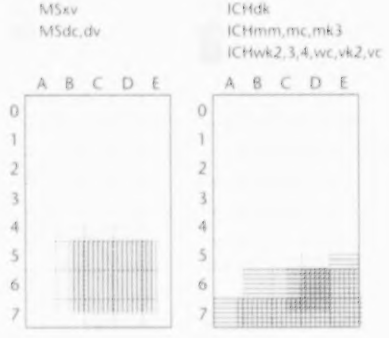
- preference for nitrogen-rich soil. (35)
- grows well in partial shade and full sunlight. (35)
- decreases in abundance after fire. (44)
- persists or may increase in abundance after clearcutting. (69)
- increases in abundance in deciduous and mixedwood, young and mature seral forests.
- grazed by ungulates and bears. (8, 40, 61, 71)



Calamagrostis canadensis – bluejoint reedgrass

Indicator Values and Species Notes

- extremely winter-hardy; tolerant of low soil temperatures. (25)
- very tolerant of flooding and saturated soils. (25)
- good drought tolerance once root system is established. (25)
- shade intolerant; grows well in full sunlight, persists in partial shade. (2, 25)
- after low- to moderate-intensity fires, re-sprouts from rhizomes and re-establishes from wind-transported seed. (2, 9)
- after fire and site disturbance, increases in abundance in pioneer and young seral stages. (2, 39)
- moderately palatable; grazed by elk, deer, bears, hares, and domestic sheep. (8, 25, 61, 71, 73)



Calamagrostis rubescens – pinegrass

Indicator Values and Species Notes

- not observed in moist and wet ICH subzones in this guide.
- tolerant of moderately cold winter temperatures and frost. (25)
- sites are often low in nitrogen if heavy *C. rubescens* exists.
- a low, dense canopy of *C. rubescens* increases the risk of conifer seedling frost damage. (59)
- tolerant of summer drought and high air temperatures. (25, 63)
- grows well in partial shade and full sunlight, persists with decreased vigour in deep shade. (25, 42)
- after low- to moderate-intensity fires will resprout from rhizomes; increased flowering after fires. (1, 9)
- increases in abundance after fire, repeated burning, and other site disturbances. (6, 44, 59)
- persists or may increase in abundance in pioneer, young, and maturing seral stages. (63)
- grazed by elk, deer, bears, hares, and cattle. (8, 25, 71, 73)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Calamagrostis stricta – slimstem reedgrass

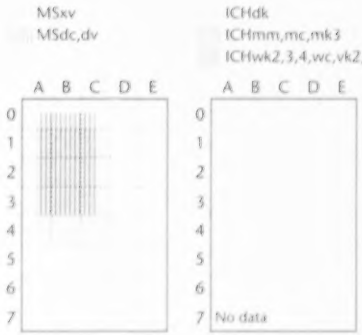
MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Carex concinnoides – northwestern sedge; *Carex richardsonii* – Richardson's sedge

Indicator Values and Species Notes

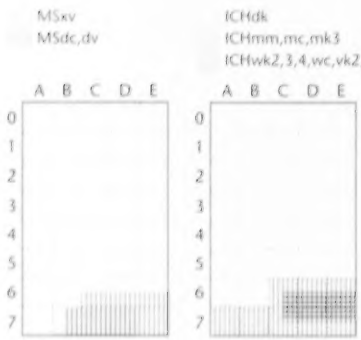
- not observed in MSdc.
- both species grow well in full sunlight and partial shade. (46, 55)



Carex disperma – soft-leaved sedge

Indicator Values and Species Notes

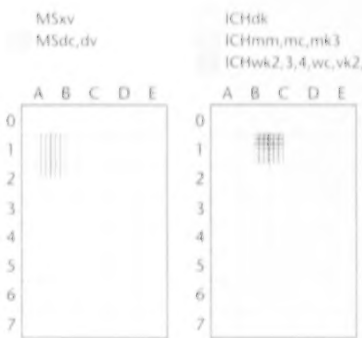
- not observed in ICHwc or ICHvk2.
- wetland indicator species when abundant. (52)
- grows well in full sunlight and partial shade. (2, 55)
- after fire, resprouts from rootstocks. (2)
- increases in abundance after site disturbance and fire, especially where mineral soil has been exposed. (2)
- *Carex* spp. are grazed by ungulates and bears. (8, 22, 40, 61)



Carex rossii – Ross' sedge

Indicator Values and Species Notes

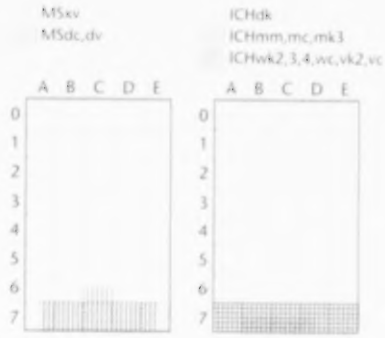
- shade intolerant; grows well in full sunlight, persists in partial shade. (46, 55)
- after fire, re-establishes from buried seed, also sprouts from surviving rhizomes. (9)
- after scarification, increases in abundance; after burning, persists in abundance, in the pioneer seral stage. (6, 9, 46, 64)
- *Carex* spp. are grazed by ungulates and bears. (8, 22, 40, 61)



Carex spp. – sedges

Indicator Values and Species Notes

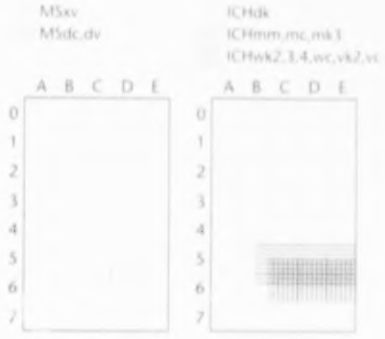
- includes: *C. aquatilis, C. atherodes, C. canescens, C. diandra, C. interior, C. lasiocarpa, C. limosa, C. magellanica, C. paucifl ora, C. sitchensis, C. tenuiflora, C. utriculata* (synonym *C. rostrata*).
- all species included are wetland indicator species, associated with saturated soils, standing water, or high watertables. (31, 46, 52)
- *C. atherodes, C. utriculata, C. aquatilis,* and *C. sitchensis* grow well in shallow water (20–40 cm deep) and in mineorotrophic and eutrophic fens. (31, 56)
- *C. interior, C. utriculata* increase in abundance after disturbance. (56, 69)
- after low-intensity fires, *Carex* spp. resprout from rhizomes. (69)
- after site disturbance, *Carex* spp. expand on wet sites by sprouting rhizomes and colonize by seed on dry sites. (69)
- *C. aquatilis, C. atherodes, C. lasiocarpa, C. limosa, C. sitchensis, C. utriculata* are important food for waterfowl, and a common component of hay from wetlands. (46, 55, 56)
- *C. canescens, C. diandra, C. interior, C. tenuiflora* seed are eaten by small birds. (56)
- *Carex* species are grazed by ungulates and bears. (8, 22, 40, 61)



Cinna latifolia – nodding wood-reed

Indicator Values and Species Notes

- shade tolerant, grows well in partial shade. (2)
- decreases in abundance after fire. (2)
- increases in abundance in pioneer and young seral stages, particularly on wetter sites.
- persists in abundance in deciduous, mature seral forests. (18)



Eleocharis palustris – common spike-rush

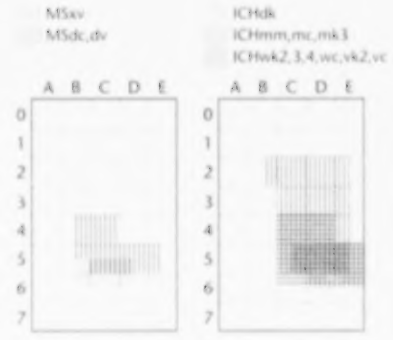
Indicator Values and Species Notes

- wetland indicator species. (46, 52)
- grows well in shallow water to 60 cm deep. (31)
- commonly occurs on saturated humus forms overlying gleysolic and organic soil orders.
- fixes nitrogen. (69)
- shade tolerant, grows well in partial shade. (69)
- after fire, resprouts from rhizomes. (69)

Elymus glaucus – blue wildrye

Indicator Values and Species Notes

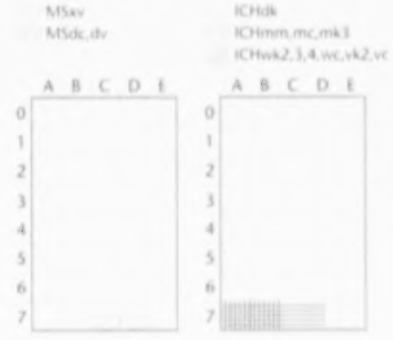
- drought tolerant. (69)
- does not grow well on shallow soils, or sites with high watertables. (69)
- grows well in full sunlight and partial shade, persists in deep shade.
- after fire and site disturbance, re-establishes with transported seed and resprouting of surviving rhizomes. (9, 69)
- persists in abundance in pioneer seral stage and deciduous, young and mature seral forests.
- often abundant in aspen stands.
- grazed by wild ungulates and livestock. (46, 40)



Eriophorum angustifolium – narrow-leaved cotton-grass

Indicator Values and Species Notes

- characteristic of nutrient-poor, peaty wetlands. (35, 46, 52)
- commonly found on saturated humus forms overlying gleysolic and organic soil orders.
- shade intolerant, grows well in full sunlight. (35)



Eriophorum chamissonis – Chamisso's cotton-grass

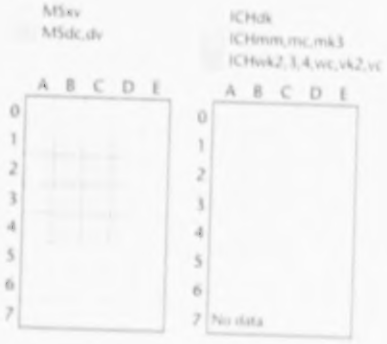
Indicator Values and Species Notes

- wetland indicator species. (52)
- commonly found on saturated mor humus forms overlying gleysolic and organic soil orders.

Festuca altaica – Altai fescue

Indicator Values and Species Notes

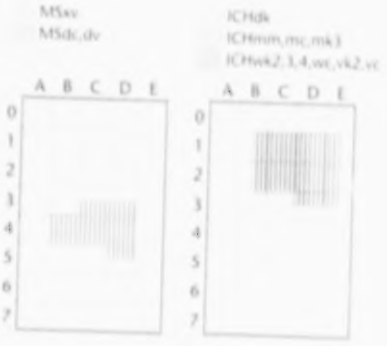
- often occurs in cold air basins and in the alpine.
- drought tolerant. (69)
- usually killed by spring burning. (54)
- re-establishes after disturbance from seeds and resprouting. (3, 54)
- grazed by ungulates and bears; resistant to moderate grazing. (3, 40, 61)



Festuca occidentalis – western fescue

Indicator Values and Species Notes

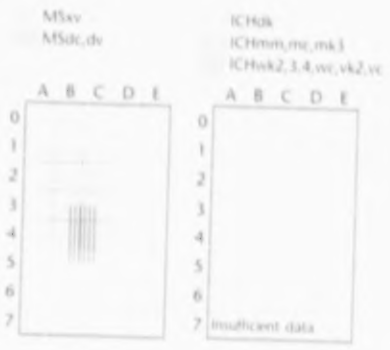
- shade tolerant, grows well in partial shade. (3, 46, 64)
- declines in abundance after low-intensity underburning. (13)
- increases in abundance after site disturbance. (19)
- *Festuca* spp. are grazed by ungulates and bears. (8, 22, 40, 61, 71)



Festuca saximontana – Rocky Mountain fescue

Indicator Values and Species Notes

- a grassland and dry, open-forest species. (46)
- shade intolerant, grows well in full sunlight. (46)
- *Festuca* spp. are grazed by ungulates and bears. (8, 22, 40, 61, 71)



Koeleria macrantha – junegrass

Indicator Values and Species Notes

- drought tolerant. (69)
- shade intolerant, grows well in full sunlight and persists in partial shade. (46)
- after low- to moderate-intensity fires, re-establishes by resprouting and from on-site seeds.
- increased seed production following frequent burning. (69)
- good forage grass; grazed by ungulates. (40, 46, 61)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wr,vk2,vr

Luzula parviflora – small-flowered wood-rush

Indicator Values and Species Notes

- persists in abundance in pioneer seral stage. (46)
- *Luzula* spp. are grazed by bears and caribou. (22, 61)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wr,vk2,vr

Oryzopsis asperifolia – rough-leaved ricegrass

Indicator Values and Species Notes

- not observed in ICHwc, ICHvc, and ICHvk2; persists in abundance in pioneer seral stage. (46)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wr,vk2,vr

Phleum alpinum – alpine timothy

Indicator Values and Species Notes

- common in subalpine and alpine areas and in cold air ponding sites at lower elevations. [46]
- grazed by deer and other ungulates. [71]

Piptatherum pungens – short-awned ricegrass

Indicator Values and Species Notes

- synonym *Oryzopsis pungens*.
- more common on southern aspects.
- grows well in partial shade and full sunlight. [46]

Pseudoroegneria spicata – bluebunch wheatgrass

Indicator Values and Species Notes

- synonym *Elymus spicatus*.
- after fire, resprouts from surviving rhizomes and re-establishes from seed. [34]
- after fire, increases in abundance in pioneer seral stage. [28]
- provides good forage for wild ungulates and livestock. [40, 46, 61]

Scheuchzeria palustris – scheuchzeria

Indicator Values and Species Notes

- wetland species, commonly found on saturated mor humus forms overlying organic soils.

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Triglochin maritimum – seaside arrow-grass

Indicator Values and Species Notes

- found in wetlands and saline meadows. (46)
- commonly occurs on organic and gleysolic soil orders.
- poisonous to humans and livestock. (46)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Trisetum spicatum – spike trisetum

Indicator Values and Species Notes

- shade intolerant, grows well in full sunlight. (46)
- persists in pioneer seral stage. (46)
- *Trisetum* spp. are grazed by mountain goat, thinhorn sheep, and bears. (8, 61)

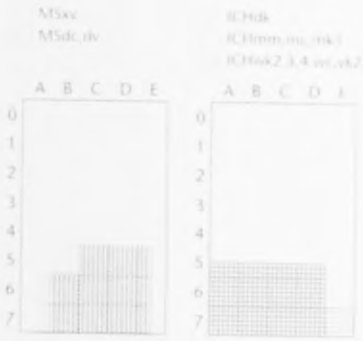
MSxv
MSdc,dv

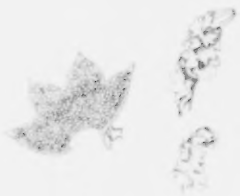
ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Aulacomnium palustre – glow moss

Indicator Values and Species Notes

- characteristic of wetlands and cold wet soils. (35)
- may indicate a frost-prone site; on mesic sites it indicates cold air ponding. (67)
- shade neutral; grows well in full sunlight and deep shade. (35)
- persists in abundance in pioneer seral stage, increases in abundance on heavily disturbed wet soils.

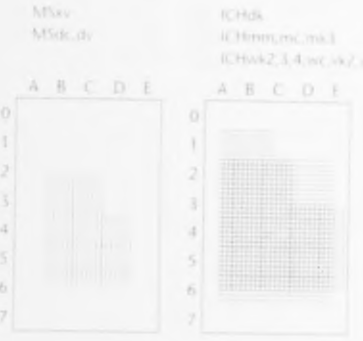




Barbilophozia spp. – leafy liverworts

Indicator Values and Species Notes

- shade tolerant, *Barbilophozia* spp. grow well in partial and deep shade.
- generally decrease in abundance in pioneer seral stage.



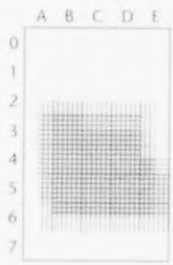
Brachythecium spp. – ragged mosses

Indicator Values and Species Notes

- *B. albicans* is characteristic of young seral forests. (34)
- *B. erythrorrhizon* and *B. rivulare* occur alongside streams and springs. (42)
- *B. leibergii* and *B. salebrosum* are present in maturing climax seral stage and old forests (>300 years). (38)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc



Calliergon spp. – water-mosses

Indicator Values and Species Notes

- *Calliergon* spp. are wetland indicator species. (52)
- commonly found on soils with saturated humus forms.
- commonly found on organic and gleysolic soil orders.

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Campylium stellatum – golden star-moss

Indicator Values and Species Notes

- wetland indicator species, occurs on calcium-rich fens. (42, 46, 52)
- commonly found on soils with saturated humus forms.
- shade intolerant, grows well in full sunlight. (46)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Cetraria spp. – Icelandmoss lichens

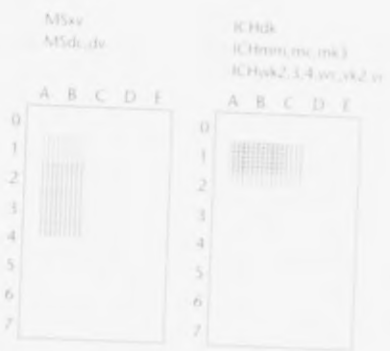
Indicator Values and Species Notes

- shade intolerant, grows well in full sunlight. (69)
- after fire, increases in abundance in pioneer and young seral stages. (32, 69)
- persists in stands for 200 years. (32)

Cladina arbuscula – greater green reindeer lichen

Indicator Values and Species Notes

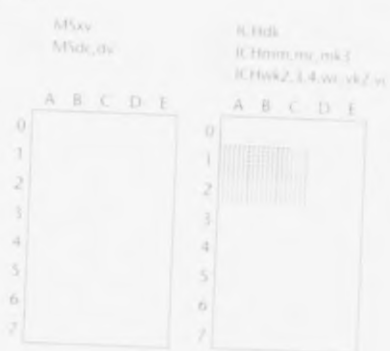
- decreases in abundance in pioneer and young seral forests.
- a late-seral species. (69)
- in old forests, replaced by mosses, except on drier sites.
- grazed by ungulates, particularly caribou. (40)

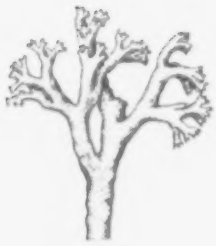


Cladina mitis – lesser green reindeer lichen

Indicator Values and Species Notes

- shade intolerant, grows well in full sunlight. (35, 42)
- decreases in abundance immediately after fire, increases in abundance in young and mature seral stages. (11, 32)
- grazed by ungulates, particularly caribou. (24)

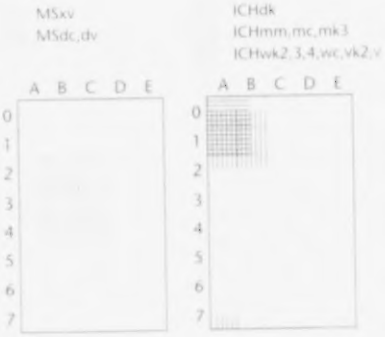




Cladina rangiferina – grey reindeer lichen

Indicator Values and Species Notes

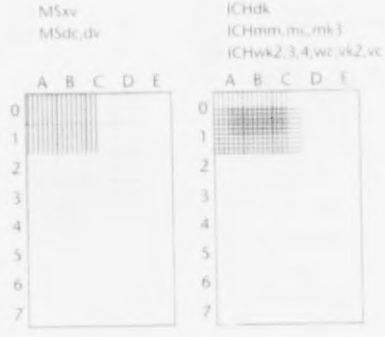
- sparse in areas with heavy snowpacks. (46)
- shade intolerant; grows well in full sunlight, persists in partial shade. (42)
- after fire, decreases in abundance in pioneer seral stage, increases in abundance in young and mature seral stage. (11, 30, 32)
- decreases in abundance in old forests where it is replaced by mosses, except on drier sites.
- an important winter food for woodland caribou. (40, 42)



Cladina spp. – reindeer lichens

Indicator Values and Species Notes

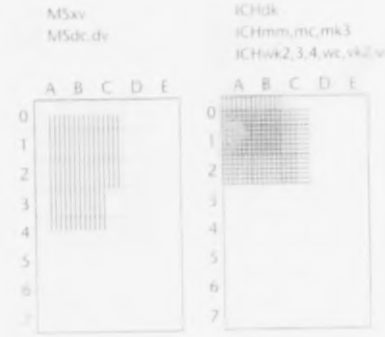
- decreases in abundance in pioneer and young seral stages.
- in old forests, replaced by mosses, except on drier sites.
- grazed in winter by ungulates, particularly caribou. (40)



Cladonia spp. – clad lichens

Indicator Values and Species Notes

- shade intolerant, *Cladonia* spp. grow well in full sunlight, persist in partial shade. (42)
- *C. gracilis* rapidly increases in abundance in young seral stage after fire; decreases in abundance in some old forests. (30, 32, 46)
- *C. cornuta* increases quickly in abundance after fire through dispersal of propagules, then declines in abundance in mature seral stands. (32)
- *C. chlorophaea*, *C. cornuta*, and *C. fimbriata* occur in maturing climax seral stage and old forests (>300 years). (38)
- *Cladonia* spp. are grazed in winter by ungulates, particularly caribou. (40, 61)



Climacium dendroides – tree moss

Indicator Values and Species Notes

- commonly found in moist depressions, along stream, fen, and lake margins. (42)
- shade tolerant, grows well in partial shade. (42)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Conocephalum conicum – snake liverwort

Indicator Values and Species Notes

- commonly found near streams. (70)
- shade tolerant, grows well in deep shade. (35)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Dicranoweisia crispula – mountain thatch-moss

Indicator Values and Species Notes

- grows on acidic rock faces in the alpine and subalpine. (42)
- can be abundant in areas where snow remains late into summer. (46)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Dicranum fuscescens – curly heron's-bill moss

Indicator Values and Species Notes

- may indicate a summer frost-prone site. (67)
- commonly occurs on soils with mor and moder humus forms and on rotting wood.
- shade tolerant, grows well in deep shade. (35)
- after fire, decreases in abundance in pioneer seral stage with a gradual increase in abundance in mature and maturing climax seral stages. (32)
- occurs in old forests (>300 years). (11)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

Dicranum scoparium – broom-moss

Indicator Values and Species Notes

- grows well in full sunlight and partial shade. (42, 46)
- occurs in maturing climax seral stage and old forests (>300 yrs). (38)

MSxv
MSdc,dv

ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc

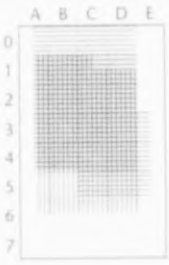
Dicranum spp. – heron's-bill mosses

Indicator Values and Species Notes

- *D. polysetum* slowly increases in abundance after fire from pioneer to maturing climax seral stage. (32)

MSxv
MSdc,dv

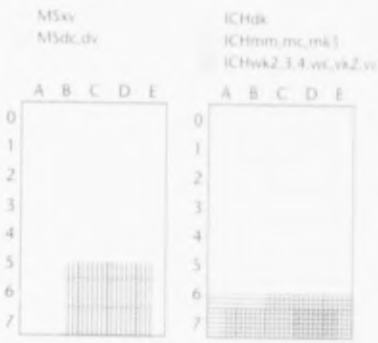
ICHdk
ICHmm,mc,mk3
ICHwk2,3,4,wc,vk2,vc



Drepanocladus spp. – hook-mosses

Indicator Values and Species Notes

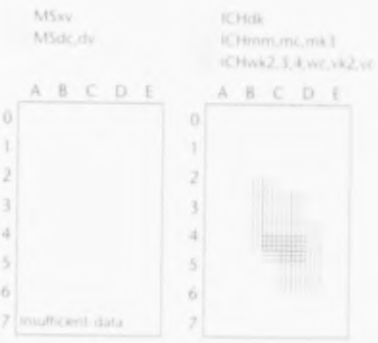
- *D. aduncus, D. crassicostatus, D. exannulatus, D. fluitans, D. revolvens, D. sendtneri,* and *D. vernicosus* are wetland indicator species. (52)
- *D. aduncus* and *D. revolvens* prefer nutrient-rich water. (42)
- *Drepanocladus* spp. commonly occur on saturated humus forms and saturated soils.
- most *Drepanocladus* spp. grow on organic and gleysolic soil orders.



Eurhynchium pulchellum – elegant beaked moss

Indicator Values and Species Notes

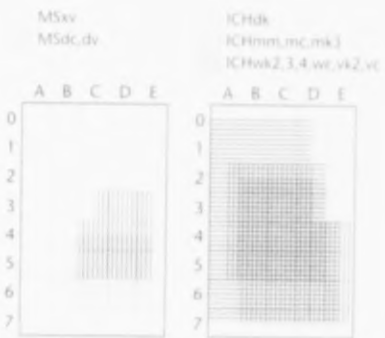
- usually found on raised microsites, tree bases, and logs. (42)
- shade tolerant, grows well in partial shade. (42)
- occurs in old forests (>300 years). (38)



Hylocomium splendens – step moss

Indicator Values and Species Notes

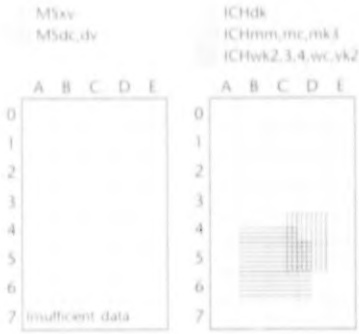
- absent or poorly represented in summer frost-prone sites. (67)
- inhabits decaying coniferous wood on nutrient-rich sites. (35)
- considered a soil nitrogen immobilizer. (18)
- grows well in partial shade and deep shade. (42)
- shade requiring; dies when there is insufficient canopy to reduce evaporation. (12, 69)
- decreases in abundance after fire and disturbance in pioneer seral stage, re-establishes when canopy closes. (18, 69)
- increases in abundance in mature seral stage. (4)
- occurs in maturing climax seral stage and old forests (>300 years). (4, 38)



Hypnum spp. – claw-mosses

Indicator Values and Species Notes

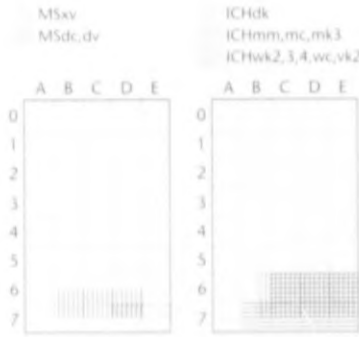
- grows on rocks, bases of trees, and logs in early stages of decomposition, and occasionally on humus.
- *H. circinale* occurs in old forests (>300 years). (38, 42)



Marchantia spp. – tongue liverworts

Indicator Values and Species Notes

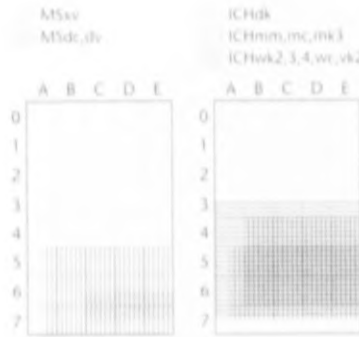
- grows on sites with fluctuating watertables. (69)
- grows well in full sunlight and persists in partial shade. (2, 35)
- after fire, rapidly re-establishes by transported spores. (2, 69)
- persists and may increase in abundance after heavy disturbance or burning in pioneer seral stage. (2, 35, 42, 46)



Mnium spp. – leafy mosses

Indicator Values and Species Notes

- includes *Mnium* spp., *Rhizomnium* spp., and *Plagiomnium* spp.
- *R. nudum* is characteristic of subalpine forests and late snowmelt sites. (35)
- *R. magnifolium* is characteristic of nutrient-rich wetlands. (35)
- *Mnium* spp., *Rhizomnium* spp., and *Plagiomnium* spp. grow well in partial shade.
- *P. drummondii* increases in abundance in young seral stands. (18)
- *P. insigne* and *R. glabrescens* decrease in abundance in pioneer and young seral stages, increase in mature seral stage. (18)
- *P. insigne* is present in old forests in the ICH zone. (42)



Pellia neesiana – shiny liverwort

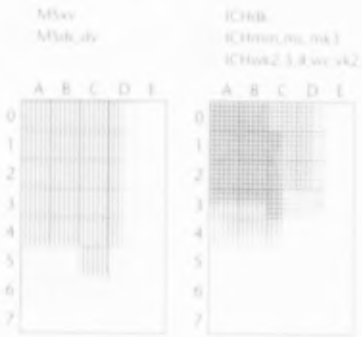
Indicator Values and Species Notes

- preference for nitrogen-rich soils. (35)
- commonly found on soils with saturated humus forms.
- shade tolerant, grows well in deep shade. (35)

Peltigera spp. – pelt lichens

Indicator Values and Species Notes

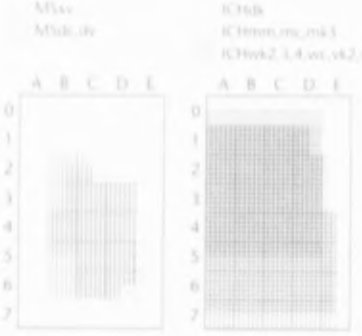
- *P. aphthosa*, *P. canina*, and *P. membranacea* contain nitrogen-fixing bacteria. (35, 69)
- *Peltigera* spp. grow well in partial shade and persist in full sunlight. (23, 35, 42)
- *P. aphthosa* and *P. malacea* decrease in abundance in pioneer seral stage after fire, abundance increases in mature and maturing climax seral stages. (11)
- *P. aphthosa and P. canina* persist in abundance in deciduous and mixedwood, young and mature seral forests.
- *P. aphthosa* and *P. membranacea* occur in maturing climax seral stage and old forests (>300 years). (38)
- *P. malacea* on seric sites continues to increase in abundance in maturing climax stage. (11)
- *Peltigera* spp. are grazed by caribou. (42)



Pleurozium schreberi – red-stemmed feathermoss

Indicator Values and Species Notes

- absent or poorly represented in summer frost-prone sites. (67)
- considered a soil nitrogen immobilizer. (18)
- shade tolerant, grows well in deep and partial shade. (35, 42)
- after fire or site disturbance, decreases in abundance in pioneer and young seral stages. (11, 32)
- occurs in maturing climax seral stage and old forests (>300 years). (38)



Pohlia spp. – nodding-cap mosses

Indicator Values and Species Notes

- *P. nutans* occurs on drier sites, *P. wahlenbergii* is common on damp sites.
- *P. nutans* is most abundant on mineral soil after site disturbance or fire. (31, 30, 42)
- *P. nutans* persists in deciduous, mature seral stages.

MSxx
MSdc,dv

ICHdk
ICHmm,mc,mk1
ICHmk2,3,4,wc,vk2,vc

Polytrichum juniperinum – juniper haircap moss

Indicator Values and Species Notes

- common on exposed mineral soil.
- may indicate a frost-prone site. (67)
- shade tolerant, grows well in partial shade. (35)
- characteristic of fire-disturbed sites. (35)
- recovers rapidly in abundance after fire, then gradually declines as stand ages. (11, 30, 32)
- increases in abundance and edatopic range on heavily disturbed sites in pioneer seral stage. (38, 42)
- persists in abundance in deciduous, young and mature seral forests.

MSxx
MSdc,dv

ICHdk
ICHmm,mc,mk1
ICHmk2,3,4,wc,vk2,vc

Polytrichum strictum – bog haircap moss

Indicator Values and Species Notes

- occurs on organic soils on boggy sites. (46, 67)

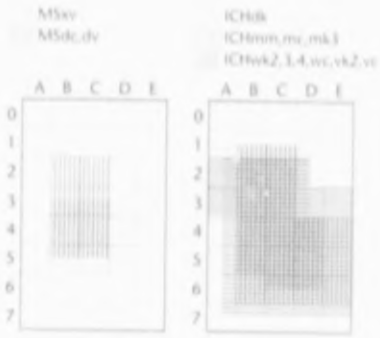
MSxx
MSdc,dv

ICHdk
ICHmm,mc,mk1
ICHmk2,3,4,wc,vk2,vc

Ptilium crista-castrensis – knight's plume

Indicator Values and Species Notes

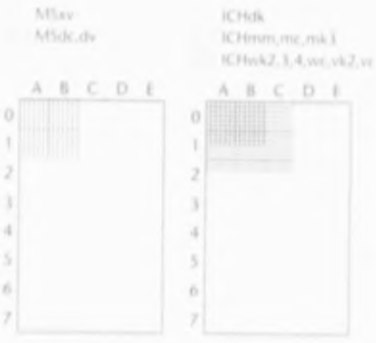
- absent or poorly represented in summer frost-prone sites. (67)
- shade tolerant, grows well in partial and deep shade. (42)
- decreases in abundance in pioneer seral stage.
- persists in abundance in mixwood and deciduous, young and mature forests.
- occurs in maturing climax seral stage and old forests (> 300 years). (38)



Racomitrium spp. – rock-mosses

Indicator Values and Species Notes

- *R. canescens* grows on sterile acidic substrates, like gravelly soil and rock outcrops. (70)
- shade intolerant, *R. canescens* grows well in full sunlight. (70)



Rhytidiadelphus loreus – lanky moss

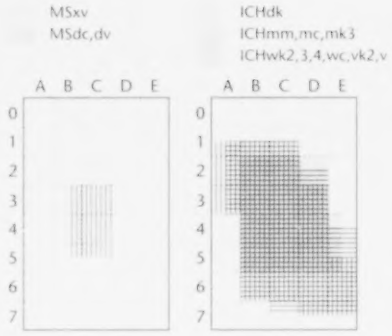
Indicator Values and Species Notes

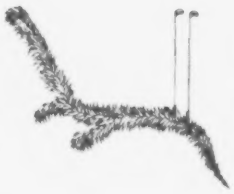
- shade tolerant, grows well in partial shade. (35)
- decreases in abundance in pioneer seral stage, increases in abundance in mature seral stage. (4)
- occurs in maturing climax seral stage and old forests (>300 years). (16, 60)

Rhytidiadelphus triquetrus – electrified cat's-tail moss

Indicator Values and Species Notes

- shade tolerant, grows well in partial shade. (35)
- decreases in abundance in pioneer seral stage, increases in abundance in mature seral stage. (4)
- persists in abundance in deciduous, mature seral forests.
- occurs in maturing climax seral stage and old forests (>300 years). (16, 60)

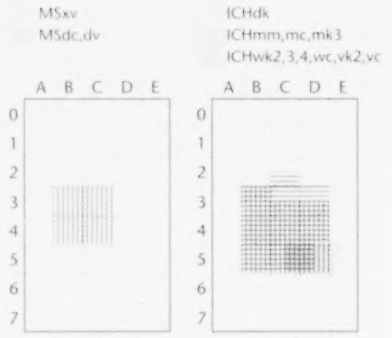




Rhytidiopsis robusta – pipecleaner moss

Indicator Values and Species Notes

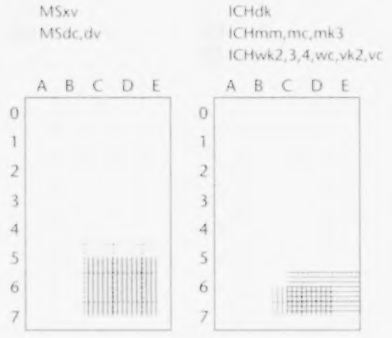
- commonly on humus and decaying wood.
- shade tolerant, grows well in partial and deep shade.
- persists in maturing climax seral stage and old forests (>300 years). (38)



Sanionia uncinata – sickle-moss

Indicator Values and Species Notes

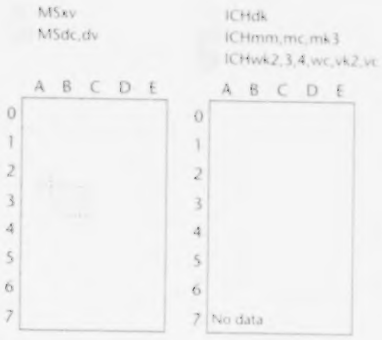
- synonym *Drepanocladus uncinatus*.
- occurs on predominantly well to imperfectly drained, upland soils.
- occurs in maturing climax seral stage and old forests (>300 years). (38)



Solorina crocea – chocolate chip lichen

Indicator Values and Species Notes

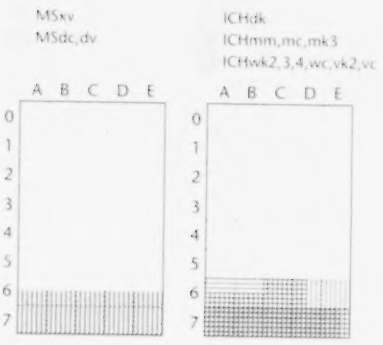
- occurs below late-lying snow patches in the alpine and subalpine. (23)

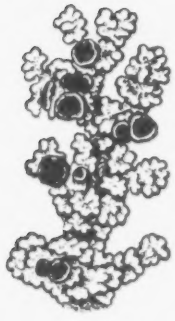


Sphagnum spp. – peat-mosses

Indicator Values and Species Notes

- many *Sphagnum* spp. are wetland indicator species. (52)
- *S. warnstorfii* is common at higher elevations. (46)
- *S. angustifolium*, *S. fuscum*, and *S. magellanicum* occur in nutrient-poor peatlands. (60, 70)
- *S. squarrosum* and *S. warnstorfii* are found on groundwater-fed wetlands. (60)
- *Sphagnum* spp. are found predominantly on organic and gleysolic soil orders.
- *Sphagnum* spp. grow well in full sunlight, persist in partial shade. (60)
- *S. fuscum* regenerates and invades rapidly after fire. (30)

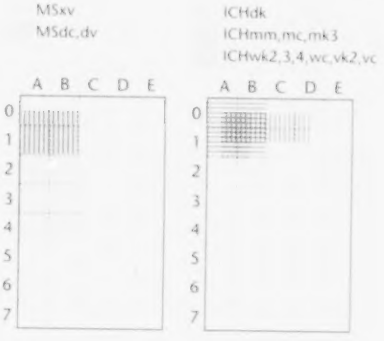




Stereocaulon spp. – foam lichens

Indicator Values and Species Notes

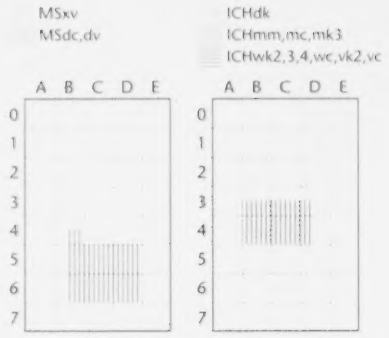
- often are abundant on rapidly drained substrates.
- *S. tomentosum* contains nitrogen-fixing bacteria. (35)
- *S. tomentosum* grows well in full sunlight. (35, 70)
- *S. tomentosum* has extremely slow recovery after fire. (11)
- *Stereocaulon* spp. are grazed by caribou. (61)



Timmia austriaca – false-polytrichum

Indicator Values and Species Notes

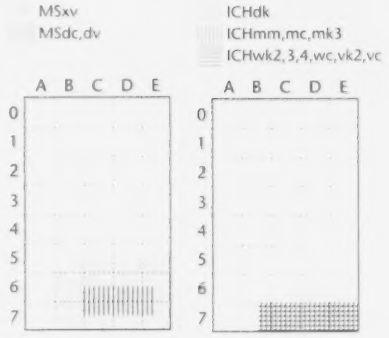
- shade tolerant, grows well in partial shade. (35, 70)
- persists in abundance in pioneer seral stage.
- occurs in old forests (>300 years). (38)



Tomentypnum nitens – golden fuzzy fen moss

Indicator Values and Species Notes

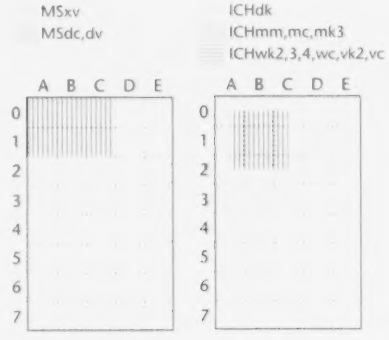
- wetland indicator species. (52)
- grows on fens and groundwater-fed wetlands. (12, 51)
- commonly found on soils with saturated humus forms.
- preference for calcium-rich sites. (70)
- shade intolerant, grows well in full sunlight. (12)



Tortula spp. – screw-mosses

Indicator Values and Species Notes

- *T. ruralis* survives well on droughty, windy sites. (69)
- shade neutral, *T. ruralis* grows in full sunlight to deep shade. (69)
- *T. ruralis* is common on mineral soil in grasslands. (46)
- *T. ruralis* is present in old forests (>300 years). (38)



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Keys to the Common Shrubs and Herbs of the Prince George Forest Region

Land Management Handbook
FIELD GUIDE INSERT 11

2003

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INTRODUCTION

Plants are important components of all ecosystems and, in conjunction with other factors such as soil characteristics, can be useful indicators in determining what type of ecosystem is present. Identifying plants is a critical component for identifying site series (ecosystem units) using the Biogeoclimatic Ecosystem Classification (BEC) system. Identifying site series is a crucial step for foresters and biologists when making decisions about possibilities for managing that ecosystem. Plants can be general or specific indicators of climate, soil moisture regime and nutrient regime, as well as successional development. For some naturalists and outdoor enthusiasts, knowing the surrounding vegetation and understanding its relationship to the ecosystem can be a form of enjoyment. Often plants can be overlooked if they are not easily identifiable and finding them in guides may be difficult and time-consuming, particularly when doing fieldwork. Many keys use technical terms that a field worker or outdoors person may not be familiar with, and often reproductive structures and a dissecting scope are needed to identify the plants. Plants can often be differentiated from one another by much more obvious characteristics such as leaf arrangement, shape and size, type of flower and fruit, and stem shape. The following keys focus on the more common shrubs and herbs in the Prince George Forest Region, separating the plants into major groups and species by characteristics that are easily identified in the field. The most common species encountered in the forests were selected for the keys. The keys have had several field tests; however, if a problem is encountered, please contact Craig Delong, Regional Ecologist, Prince George Forest Region. **Some common terms and descriptions that may be useful in using the key follow.**

Leaf Arrangement

How leaves are attached to the stem can be very useful for separating plants into major groups. Leaves can be classified as sessile (directly attached to the stem) or as petiolate (a petiole or stalk attaches the leaf to the stem). Spatial arrangement can also be another important feature. Leaves can be arranged along the stem alternately, oppositely, or whorled (Figure 1). It is important to determine if the leaf is simple or compound. Simple leaves attach directly to the stem and have only one blade. There is an axillary bud or stipule where the leaf attaches. A compound leaf is divided into leaflets; at the base of each leaflet there are no stipules or axillary buds present; these will be at the base of the whole leaf. **As this characteristic is very significant and can often be confusing, careful inspection of the leaf attachment is important.**

Leaf Venation

Leaf venation is another characteristic that can be used in separating out families of plants. Leaves with parallel leaf venation are in the Class

Liliopsida (the Monocotyledons), which include lilies, orchids, sedges, and grasses. Parallel leaf venation is fairly obvious, as the veins in the leaf run parallel to each other from the base of the leaf. Vascular plants that have netted or pinnate venation are included in Class Magnoliopsida (Dicotyledons), and have veins usually arising from a central vein and then branching into a netted pattern (Figure 1). **When checking leaf venation ensure that you hold the leaf up to the light as some of the Class Magnoliopsida have distinct veins running parallel but faint netted veins in between.**

Leaf arrangement

Compound leaves

Leaf shape

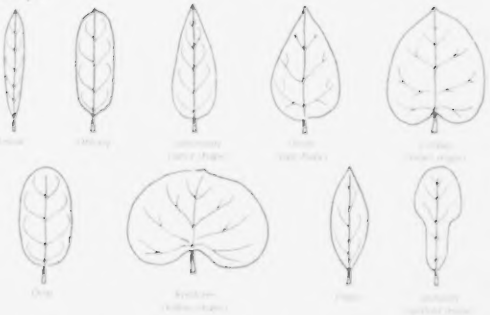
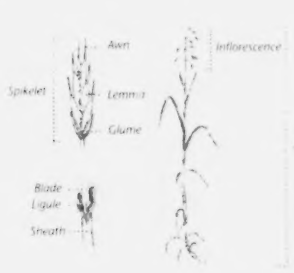


FIGURE 1 *Illustrations of leaf arrangements and shapes, as well as the types of compound leaves.*

Flowers

Flowers, when they are present, can be extremely useful when identifying plants. Flowers are often showy, colourful, and distinctive to many families. Knowing what kind of flower, the shape, and what parts are present can often differentiate two similar plants. Flowers are often arranged into clusters called inflorescences, which have different shapes and can be situated at different places on the plant. Grass flower parts are illustrated in Figure 2.

Grass flower parts



Carex

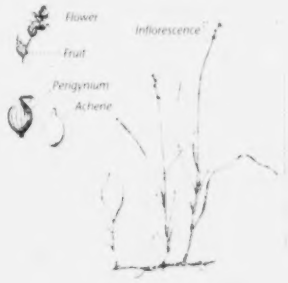


FIGURE 2 *Illustrations of grass flower parts and the inflorescence of the sedges (Carex genus).*

USING THE KEYS

1. If there is more than one plant of the species that you are trying to identify in the plot, ensure that the one you are using for the key is the most advanced in terms of flowers or fruiting structures.
2. If the leaves of the plant vary much in shape, use the leaf shape that is most common on the plant.
3. When using the key you will be given two choices for each number, a or b. Choose between the two descriptions and then go to the next number listed below your last choice. The numbers do not necessarily follow a chronosequence (e.g., 1b may go to 21a or 21b) so follow the sequence of numbers below each of your choices. The keys provide descriptions that are comparable. For some choices additional information is provided in italics to help confirm the identification.
4. If you have difficulty deciding between the two alternative statements in the keying process, follow both routes to see which one leads to the most likely plant.

5. If a plant does not seem to key out after a few tries, collect the plant and take it to a more experienced person for identification, since many of the less common plants found in the forests of northern British Columbia are not included in the keys.
6. Plant names reflect the common and scientific names in *Plants of Northern British Columbia* (MacKinnon et al. 1999). The numbers refer to the page numbers where the plant is located in that publication . The updated scientific names (Meidinger et al. 2002) are listed afterward.

KEY TO THE COMMON SHRUBS OF THE PRINCE GEORGE FOREST REGION

1a Leaves arranged in an alternate pattern on branches.
2a Leaves toothed or serrated along the outer margins.
3a Stems and branches armed with thorns or prickles.
4a Leaves divided into 3–7 leaflets, not lobed, each leaflet distinctly toothed and elliptic in shape.
5a Leaflets opposite, usually 5–7; flowers large pink and showy; fruit red "hips" ..... ***Rosa acicularis*** (27)[1]

Rosa acicularis

5b Leaflets usually arranged in a triangle of 3 at terminus of branches; flowers white; fruit red "raspberries," edible ..... ***Rubus idaeus*** (27)
4b Leaves with 5–7 lobes, not divided into leaflets, toothed and maple leaf shaped.
6a Leaves usually large (10–50 cm across) with spines on underside; fruit terminal cluster of red berries; *with a thick, thorny stem* ..... ***Oplopanax horridus*** (36)
6b Leaves smaller than above, 5 lobed, no spines under leaves; fruit black, with bristles..... ***Ribes lacustre*** (32)
3b Stems and branches not armed.
7a Leaves lobed.
8a Leaves distinctly 3 lobed, lobes round, broadly heart shaped; *red smooth berries*..... ***Ribes triste*** (33)
8b Leaves are 5–7 lobed, lobes sharp, maple leaf shaped.

Ribes laxiflorum

9a Leaves sharply toothed, lobes distinctly cut, smooth on top, finely hairy underneath; flowers reddish purple; fruits purplish black berries..... ***Ribes laxiflorum*** (34)
9b Leaves finely toothed (serrated), lobes fairly broad, finely fuzzy on both sides; flowers white with crinkled petals; raspberry-like fruit ..... ***Rubus parviflorus*** (36)
7b Leaves or leaflets entire, not lobed.
10a Leaves smooth or if toothed then not toothed along entire margin.
11a Leaves come to sharp point at end, stem hairy; *berries dull blue*..... ***Vaccinium myrtilloides*** (43)
11b Leaves blunt to rounded at ends and stem not hairy.
12a Leaves rounded, somewhat spreading shrub up to 1.5 m tall; *berries drooping, purple to black* ..... ***Amelanchier alnifolia*** (46)
12b Leaves oblong-shaped; spreading or erect shrub up to 1 m high.

1 Numbers refer to page numbers in the publication *Plants of Northern British Columbia* (MacKinnon et al. 1999)

13a Leaves smooth-margined; blue berries ..... ***Vaccinium ovalifolium*** (42)

13b Leaves toothed along portion of margin; fruit are capsules.

14a Leaves oval; white flowers arranged in a flat-topped cluster ..... ***Spiraea betulifolia*** (46)

14b Leaves slender; pink flowers arranged in a long, narrow compact cluster..... ***Spiraea douglasii*** (45)

10b Leaves toothed along entire margin.

15a Leaves compound, *leaflets arranged opposite on branchlet; shrub up to 5 m tall; flowers white, in flat-topped clusters; berries smooth, red*..... ***Sorbus scopulina*** (28)

14a

Spiraea betulifolia

15b Leaves simple.

16a Nearly circular leaves, *thick and leathery, dull underside of leaf, reddish bark with wart-like glands* ..... ***Betula glandulosa*** (39) ***B. nana***

16b Elliptical to lance-shaped leaves.

17a Leaves coarse-toothed with blunt tip, buds club-shaped with short stalks; *stems erect, tree-like* ..... ***Alnus tenuifolia*** (38) ***A. incana***

17b Leaves finely toothed, sharp tip on leaves; buds pointed without stalks.

18a Low shrub; leaves narrow; *flowers pinkish; fruit a purplish to reddish drooping berry*..... ***Vaccinium membranaceum*** (42)

18a

Vaccinium membranaceum

18b Tall shrub; leaves oval, *somewhat shiny on the underside, no hairs along leaf stem and greyish bark* ..... ***Alnus crispa*** (37) ***A. viridis***

2b Leaves smooth along the outer margins.

19a Shrubs erect; with narrow, linear leaves; *grey bark.*

20a Leaf shape broad, tapering to narrow base, leaf sparsely hairy below, twigs have small hairs..... ***Salix scouleriana*** (76)

20b Leaf shape broad, but tapered at both ends, leaf hairy on both sides; twig covered in wavy, tangled hairs..... ***Salix bebbiana*** (76)

19b Shrubs spreading and low; leaves not linear.

21a Leaves oblong, glossy, dark green, *upper surface has fine rusty hairs, flowers white, cup-shaped, in clusters of 2–3*..... ***Rhododendron albiflorum*** (41)

20a

Salix scouleriana

21b Leaves narrow, leathery, dull green.

22a Leaves have fuzzy reddish hairs on underside and margins are curled, distinct musky odour; flowers white, in umbrella-like clusters..... ***Ledum groenlandicum*** (40)

22b Leaves with no reddish fuzz on underside; wavy margins; skunky odour when crushed; flowers orange-green in drooping clusters ..... ***Menziesia ferruginea*** (41)

1b Leaves arranged in an opposite pattern on branches.

23a Leaves toothed or serrate along the outer margins.
24a Leaves 3–5 lobed.
25a Leaves maple leaf shaped (usually 5 lobed), coarsely toothed; flowers greenish yellow, in small clusters with the leaves ..... ***Acer glabrum*** (35)
25b Leaves 3 lobed, sharply toothed, often a pair of teeth near the junction of the blade and stem; flowers white in clusters on short stems (not with leaves) ..... ***Viburnum edule*** (35)
24b Leaves not lobed.
26a Leaves simple, evergreen, leathery, and finely toothed; somewhat curled under; stems erect or prostrate ***Paxistima myrsinites*** (44)
26b Leaves compound.
27a Tall shrub; flowers white in a rounded cluster, with a foul odour; berries red and smooth; *leaflets lance-shaped (narrow and long), large, with pointed tips*..... ***Sambucus racemosa*** (29)
27b Low shrub; flowers bright yellow, in clusters; berries a bluish colour; *leaflets glossy dark green, with several spiny teeth along the margins, (feels like leaflets are laminated)* ..... ***Mahonia aquifolium*** (52)

25a
Acer glabrum

23b Leaves smooth along the outer margins.
28a Leaves have parallel veins, *elliptic shape with a distinct point; young stems round; flowers white in cluster at terminus of branch*..... ***Cornus stolonifera*** (48)
28b Leaves with netted (pinnate) venation.
29a Leaves pointed at tip; *young stems square; flowers yellow, tubular, and in pairs in the axil of the leaf; fruit large black berry (in pairs), not edible* ..... ***Lonicera involucrata*** (48)
29b Leaves blunt at tip.
30a Young stems have copper blotches; leaves oval, dark green on top, felt of whitish hairs on underside with rusty blotches; flowers, small and yellow; bright red berries, soapy to touch (bitter) ..... ***Shepherdia canadensis*** (49)
30b Young stems slender and smooth; leaves oval, light green; flowers pink to white and bell-shaped, often terminal; fruit round, white berry, inedible..... ***Symphoricarpos albus*** (52)

27a
Sambucus racemosa

29a
Lonicera involucrata

KEY TO THE COMMON HERBS OF THE PRINCE GEORGE FOREST REGION

1a Leaves prominent; *most stems herbaceous.*

2a Leaves parallel veined.

3a Leaves oblong to elliptical in shape.

4a Leaves basal (i.e., no stem).

5a *1–2* large round leaves, *glossy, fleshy; flowers white to pale green, 5–25 arranged along terminus of erect stem* ..... ***Platanthera orbiculata*** (138)

5b Leaves more linear.

6a Several leaves in a basal rosette, dark green, with a pale mottled pattern; flowers pale, white, small, arranged in a terminal spike, often oriented to 1 side..... ***Goodyera oblongifolia*** (141)

Goodyera oblongifolia

6b Usually 2–3 leaves arranged in a basal rosette, lighter green, longer, no pattern; 1 single, white flower, cup-shaped at terminus of erect stem; fruit a metallic blue berry..... ***Clintonia uniflora*** (131)

4b Leaves arranged along stem.

7a Leaves clasping stem (wrapped around the stem).

8a A pair of leaves attached to stem, *leaves opposite and joined; flowers green to purplish*..... ***Listera cordata*** (140)

8b Multiple leaves attached to stem.

9a Stalk straight. *Leaves accordion pleated, very large; flowers star-shaped, yellow-green, and arranged in drooping terminal tassel*..... ***Veratrum viride*** (132)

9b Stalk looks twisted where leaves clasp.

10a Leaves with hairs hooked forward along margins, oval-shaped with pointed tips; brownish woody stem; flowers white and bell-shaped at tip of branch ..... ***Disporum hookeri*** (127) ***Prosartes hookeri***

Prosartes hookeri

10b Leaf margins without hairs, may have irregularly spaced teeth, leaves oval to broad; green stem; greenish bell flowers, attached by a kinked stalk, hanging from leaf axil..... ***Streptopus amplexifolius*** (128)

7b Leaves not clasping stem.

11a Leaf margin has fine hairs, flowers stem from each leaf axil; *leaves oval to elliptic; stems usually unbranched; flowers pinkish, bell-shaped*..... ***Streptopus roseus*** (129) ***S. lanceolatus***

11b No hairs on leaf margin; cluster of flowers at end of stem.

12a Short herb (up to 30 cm); leaves attached with short stalk to stem, hairy below, broad to heart-shaped with pointed tip; flowers white ..... ***Maianthemum canadense*** (131)

12b Tall herb (taller than 30 cm); leaves somewhat clasping stem, not hairy, broad to elliptical; flowers white ..... ***Smilacina racemosa*** (130) ***Maianthemum racemosum***

3b Leaves long and narrow (at least 10x longer than wide).

13a Leaves attached to stem in whorls of 4, *pointed, but blunt-tipped with 3 prominent nerves; terminal cluster of numerous, fragrant, white flowers* ..... ***Galium boreale*** (219)

13b Leaves not in whorls, may be attached at base or up stem.

14a Stems triangular and solid; *flowers arranged in terminal inflorescence of small, well separated, greenish spikelets; leaves thin, soft, and often shorter than stem* ..... ***Carex disperma*** (260)

12a

Maianthemum canadense

14b Stems round and hollow.

15a Inflorescence a spike (spikelets attached directly to stem and closely arranged).

16a One spikelet at each node, spikes slender; *leaves usually flat, several along stem; auricles absent* ..... ***Agropyron trachycaulum*** (231) ***Elymus trachycaulus***

16b Two spikelets at each node, forms dense spike; auricles are claw-like.

17a Spike fuzzy; leaves thin, stiff, inrolled ..... ***Elymus innovatus*** (232) ***Leymus innovatus***

17b Spike not fuzzy, erect, dense; leaves lax and only slightly in-rolled ..... ***Elymus glaucus*** (232)

15b Inflorescence not spike-like.

18a Leaves lay on ground or tufted, plant often solitary; *inflorescence simple, auricles absent* ..... ***Oryzopsis asperifolia*** (241)

18b Leaves erect, plants often forming extensive cover.

19a Leaves long, collar where leaf joins stem distinctly hairy, *base of stems red; inflorescence dense and elongate.* ..... ***Calamagrostis rubescens*** (240)

19b Leaves long, collar not hairy.

20a Awns long and conspicuous.

21a Stem hairy *and purple towards base*; leaves flat and hairy on one surface; glumes similar in size, awns straight ..... ***Bromus vulgaris*** (244)

21b Stems smooth; leaves flat and not hairy *with thin pointed tips;* second glume longer than first with a sharp, hooked tip, awns bent ..... ***Trisetum cernuum*** (235)

20b Awns lacking or inconspicuous.

18a

Oryzopsis asperfolia

22a Leaves rough and long; inflorescence nodding and fairly open to dense ... . ***Calamagrostis canadensis*** (239)

22b Leaves soft and wide, *attaching at right angles to stem;* inflorescence is drooping and very open ..... ***Cinna latifolia*** (243)

2b Leaves with netted (pinnate) venation.

23a Leaves entire or divided with lobes.

24a Leaves thick and waxy, evergreen.

25a Leaves serrated or toothed, *basal, and lance-shaped, very dark green; waxy pink flower on erect stem*.. ***Chimaphila umbellata*** (90)

25b Leaf margins smooth.

26a Leaves covered in brown hairs on surface, *leathery, margins rolled under; flowers pinkish and bell-shaped, in axils of leaves*..... ***Gaultheria hispidula*** (88)

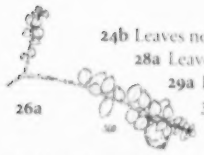
22b

Cinna latifolia

26b Leaves without hairs.

27a Leaf margin flat, leaves teardrop-shaped, no glands; terminal cluster of urn-shaped flowers; trailing shrub .. .. ***Arctostaphylos uva-ursi*** (82)

27b Leaf margin rolled under, leaves more egg-shaped, with dark glands underneath; terminal cluster of bell-shaped flowers; mat-forming shrub .... ***Vaccinium vitis-idaea*** (83)



26a

Gaultheria hispidula

24b Leaves not waxy, deciduous.

28a Leaves lobed (deeply dissected margins).

29a Leaves or leaflets with 2–5 lobes.

30a Stems creeping, *leaves and flowers on short erect stems; leaves dissected into 3 leaflets or lobes, coarsely toothed; single, white flowers; red, berry-like fruit in clusters* .... ***Rubus pedatus*** (92)

30b Stems erect.

31a Main leaves basal, stem leaves reduced in size; *divided into 3 leaflets that are irregularly lobed, coarsely toothed, and finely hairy; flowers small and delicate in clusters on fine stalks*..... ***Tiarella trifoliata*** (147) var. ***unifoliata*** - similar but leaves 3–5 lobed (maple leaf shaped), not leaflets.

31b Leaves all along stem.

32a Stems erect, mostly unbranched; *leaves divided 3–5 times into threes, each leaflet is 3 lobed (rounded) on fine stalk from stem* .... ***Thalictrum occidentale*** (156)

32b Stems erect, with leafy branches.

33a Leaves divided into 9 leaflets on 3 main stalks, coarsely toothed and pointed; flowers in umbrella-shaped clusters; black needle-like fruits..... ..... ***Osmorhiza chilensis*** (180) *O. berteroi*

32a

Thalictrum occidentale

33b Leaves divided 2–3 times into 3, *crinkly,* coarsely toothed, pointed; flowers in rounded clusters; red and white smooth berries..... ***Actaea rubra*** (156)

29b Leaves or leaflets with 5–9 lobes.

34a Plants up to 50 cm tall; leaves basal; *undersides white, hairy (woolly); white and pinkish flowers emerge before leaves on hairy, erect stems* ..... ***Petasites frigidus*** (114)

34b Plants 1 m and taller; leaves attached up stem.

35a Leaves with slender lobes, stem not hairy; flowers dark purple with spurs, in elongate, terminal cluster..... ***Delphinium glaucum*** (154)

35b Leaves with broad lobes, stem hairy; flowers white in a flat-topped terminal cluster..... ***Heracleum lanatum*** (181) ***H. maximum***

28b Leaves or leaflets not lobed.

36a Leaf margins smooth.

33b

Actaea rubra

37a Leaves compound, *leaflets opposite and pinnate; stems vine-like with tendrils.*

38a Stipules small, narrow, and sharply toothed; *leaflets small, linear, in 4–9 pairs; flowers purple in terminal cluster* ..... ***Vicia americana*** (169)

38b Stipules conspicuous with smooth margins.

39a Stipules narrow and linear; leaves divided into 2–5 pairs of leaflets, which are oval and taper to point at both ends ..... ***Lathyrus nevadensis*** (169)

39b Stipules large, broad, and ear-shaped; leaves divided into 3–4 pairs of leaflets, which are more broadly oval and taper at 1 end to a point ..... ***Lathyrus ochroleucus*** (168)

37b Leaves simple.

41a

Galium triflorum

40a Leaves narrow to lance-shaped, *sessile (no leaf stem).*

41a Leaves in whorls of 5–6 around the stem, *underneath the leaf there are hooked hairs on midrib;* stems trailing, branched; flowers greenish, small, 3 on stalk, from the axils of the leaves..... ***Galium triflorum*** (220)

41b Leaves alternate; stems erect, usually unbranched; flowers purple, large, several in terminal cluster..... ***Epilobium angustifolium*** (213)

43a

Geocaulon lividum

40b Leaves oval-shaped.

42a Leaves in basal rosette, *shiny; flowers pink and surrounding entire erect stalk* ..... ***Pyrola asarifolia*** (185)

42b Leaves attached up the stem, *alternate.*

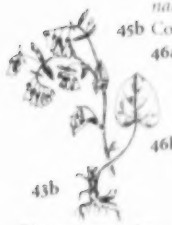
43a Leaves not hairy, with blunt tips, almost sessile, often with a yellow or white pattern; stems single; flowers purple, inconspicuous in upright clusters..... ***Geocaulon lividum*** (197)

43b Leaves coarsely hairy; *basal leaves heart-shaped, with long stems* blunt tipped; *stem leaves pointed and almost sessile*; leaves not patterned; stems solitary to several; flowers blue and bell-shaped, drooping in open clusters ..... ***Mertensia paniculata*** (218)

36b Leaf margins coarsely to finely toothed.

44a Leaves compound.

45a Finely toothed leaf margin; *single compound leaf with 3 branches, each with 3–5 leaflets; small flowers arranged in clusters, or balls on naked stems* ..... ***Aralia nudicaulis*** (214)



43b

Mertensia paniculata

45b Coarsely toothed leaf margin.

46a Stems erect, *square*; leaves divided into 3–7 large, stalked leaflets, *arranged in pairs on stem, terminal leaflet largest; flowers white, arranged in terminal, flat-topped cluster that appears "fluffy"* ..... ***Valeriana sitchensis*** (223)

46b Stem creeping; basal leaves divided into 3 leaflets.

47a Leaflets oblong; terminal tooth of leaflet is half as long and wide as adjacent teeth; white flowers on short erect stems; fruit a cluster of red strawberries.. ***Fragaria virginiana*** (167)

47b Leaflets somewhat diamond-shaped and pointed; teeth of similar size; white flowers on erect stem; fruit a cluster of dark red raspberries..... ***Rubus pubescens*** (91)

44b Leaves simple.

48a Leaves heart-, kidney-, egg-, oval-, or elliptic-shaped.

49a Leaves opposite along a creeping stem, with some erect branches; *leaves oval, with two notches near tip; flowers paired pink, bell-shaped flowers on y-shaped stalk* .. ***Linnaea borealis*** (83)

49b Leaves form a basal rosette with an erect flowering stalk, *which may have leaves.*

50a Leaves have stiff erect hairs on upper leaf surface, *round-toothed margins; flowers saucer-shaped in terminal clusters on erect stem* ..... ***Mitella nuda*** (143)

47a

Fragaria virginiana

50b Leaves without hairs on upper surface.

51a Basal leaves heart- to kidney-shaped.

52a Stem leaves heart- or kidney-shaped, *hairy, paired, larger than basal leaves, and sessile towards the top of the stem; composite flowers yellow with 1–4 flower heads on a hairy stalk* ..... ***Arnica cordifolia*** (112)

53a

Aster conspicuus

52b Stem leaves egg-, oval-, or elliptic-shaped; *basal leaves wither quickly; blue ray flowers and yellow disc flowers, few to many heads present.*

53a Stem leaves clasp the stem, *leaves sharp-toothed, sandpapery when mature* ..... ***Aster conspicuus*** (116)

54b

Moneses uniflora

53b Lower and middle stem leaves have long, broadly winged stalk, *stalk has hairy margins*, leaves become sessile towards top of stem..... ***Aster ciliolatus*** (117)

51b Basal leaves egg-, oval-, or elliptic-shaped.

54a Flowers on 1 side at the terminus of erect stem, pale green and bell-shaped; *leaves dark green on top, paler on underside*..... ***Orthilia secunda*** (153)

54b Flower solitary and terminal on a leafless stem, white and waxy; *leaves glossy, thin, veiny*..... ***Moneses uniflora*** (183)

48b Leaves narrow, lance-shaped to triangular, *with a square base and strongly toothed margin; stem leaves smaller towards top, becoming sessile; composite flowers yellow in a flat-topped cluster*..... ***Senecio triangularis*** (107)

23b Leaves pinnately (multiple times) dissected and/or divided.

55a Leaves pinnately dissected twice, stalked below and sessile above; flowers present, *white, numerous heads in a flat- or round-topped cluster*..... ***Achillea millefolium*** (106)

57b

Dryopteris expansa

55b Leaves pinnately dissected 2–3 times, into fronds, stalked; flowers not present, spores on undersides of leaves; *young leaves form fiddleheads*.

56a Fronds erect, branched into 3 blades, leaves tripinnate, *each triangular*..... ***Gymnocarpium dryopteris*** (293)

56b Fronds erect, unbranched, leaves bipinnate.

57a Frond silhouette diamond-shaped, tapering at both ends..... ***Athyrium filix-femina*** (291)

57b Frond silhouette broadly triangular, square at base and tapers at upper end..... ***Dryopteris expansa*** (292)

1b Leaves reduced (branch-, needle-, or scale-like).

58a Stems erect, grooved, jointed, and rough to touch; leaves reduced, usually in whorls.

60a

Equisetum arvense

59a Stems unbranched, *stems kinked* with conspicuous black joints (nodes) present..... ***Equisetum scirpoides*** (284)

59b Stems with branches, whorled around the centre at each joint (node).

60a Fine branches branched again..... ***Equisetum sylvaticum*** (281)

60b Long coarse branches not branched again..... ***Equisetum arvense*** (282)

58b Stems horizontal and erect, with numerous needle-like or scale-like leaves.

61a Stems with scale-like leaves, *fused to the stems (resembling cedar); usually 2–3 cones on long, forked stalk* .....
..... ***Lycopodium complanatum*** (286) ***Diphasstrum complanatum***

61b Stems with needle-like leaves.

62a Stems irregularly and many times branched, *tree-like in appearance* ..... ***Lycopodium obscurum*** (285)

62b Stems once or twice branched..... ***Lycopodium annotinum*** (287)

62b

Lycopodium annotinum

GLOSSARY

alternate – leaves attached in an offset pattern along a stem.
auricle – a small projecting ear-shaped lobe or appendage.
awn – a slender, bristle-like terminal appendage.
axil – the point of the angle formed by the leaf or petiole with the stem.
axillary – located in or arising from an axil.
bud – an undeveloped leafy shoot or flower.
compound – leaves are divided into leaflets; at the base of each leaflet there are no stipules or axillary buds present.
disk flower – tubular flower that arises from a broadened stem top.
glume – bract-like appendage at the base of the grass spikelet, on outside of flower.
inflorescence – cluster of flowers.
lemma – one of a pair of bracts that subtend the individual flowers in grass spikelets.
lobe – a division of a leaf.
netted leaf venation – veins usually arising from a central vein and then branching into a netted pattern.
opposite – leaves attached in pairs to the stem.
parallel leaf venation – veins in the leaf run parallel to each other from the base of the leaf.
petiolate – a petiole or stalk attaches the leaf to the stem.
pinnate – in form of a feather; a compound leaf in which the leaflets are place on each side of a common axis.
ray flower – strap-shaped flower that is attached to the edge of the broadened stem top.
sessile – leaf attached directly to the stem.
simple – leaves attach directly to the stem and have only one blade.
stipule – an appendage at the base of the leaf stalk, attached to the branch.
tendril – a slender, coiling organ used for support by a climbing plant.
whorled – leaves attached in a circle around the stem.

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